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CONTENTS

TOXICITY OF PETROLEUM HYDROCARBONS AND REFINED OIL WATER-SOLUBLE FRACTIONS TO INTERTIDAL CLAM, *GAFRARIUM DIVARICATUM*

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ABSTRACT

Acute toxicity (LC_{50}) of petroleum hydrocarbons like xylene and benzene as well as water soluble fractions of refined oils such as gear and mobile oil to *Gafrarium divaricatum* for 96 h were 720 ppm, 960 ppm, 25% and 30%, respectively. Xylene is more toxic than benzene and gear oil-WSF more toxic than mobile oil-WSF to the clam. The large variations in between 24 and 96 h LC_{50} values of these pollutants indicate that closing of the shell valves is beneficial to the clams to avoid higher concentration of pollutants in the surrounding medium. Sub-lethal exposures to xylene (4.25 and 8.50 mg/l), benzene (4.35 and 8.70 mg/l) and gear oil-WSF (1 and 2%) for 30 days inflicted varying degrees of degeneration in hepatopancreas and gills of the clam.

Key words: *Toxicity, xylene, benzene, gear oil-WSF, mobile oil-WSF, hepatopancreas, gill,* Gafrarium divaricatum.

With increase in off-shore exploration, development of oil resources and continued transport of oil, marine ecosystem experience varying degrees of oil exposures (Boylan and Tripp, 1971; Axiak *et al*., 1988; Sen Gupta *et al* ., 1993; Suchanek, 1993; NRC, 2003). The refined oil contains more aromatic hydrocarbons which are toxic to marine organisms. Therefore, the refined oils (gear and mobile oil) as well as aromatic hydrocarbons (xylene and benzene) were selected during the present investigation as the test pollutants. Although bioassay test was originally used to determine potency of pharmaceutical drugs and vitamins, this test has been extended to toxicological investigations too. Sprague (1973) defined bioassay as test in which quantity or strength of the pollutant material is determined by the reaction of living organisms to it whereas Chapman and Long (1983) defined bioassay test as estimation of the amount of biologically active substances by the levels of their effects on test organisms. Bioassays which are also referred to as acute toxicity studies determine the sensitivity of organisms to pollutants when organisms are exposed to a series of concentrations of a known or suspected toxicant under sufficiently controlled conditions. Therefore, bioassay tests also play a major role in aquatic toxicology because survival which in acute toxicity studies is considered as the best index of pollutant stress.

Generally, during acute toxicity tests, selected experimental organisms are exposed to a wide range of concentrations of the toxic substance under controlled laboratory conditions in order to measure its effects in comparison with control animals. The results of acute bioassay tests are frequently represented in terms of median lethal concentration (Tlm) which denotes the condition that produces 50% kill or permits 50% survival of the test organisms. Other terms like LC_{50} or LD_{50} are also used to express the results of acute toxicity tests. LC_{50} values represent the concentration of the test material at which 50% of the test animals die (Litchfield and Wilcoxon, 1947). The widespread pollution of marine environment by petroleum and constituent hydrocarbons has made it

obligatory to determine the acute toxicities of oil and related hydrocarbons on the organisms inhabiting such ecosystem (Capuzzo and Lancaster, 1982; Sen Gupta *et al*., 1993; Sukhanek, 1993; NRC, 2003). An attempt has, therefore, been made to record the toxicity of xylene and benzene as well as gear and mobile oil-WSFs to *Gafrarium divaricatum*. Histopathological alterations in hepatopancreas and gill of the clam to chronic exposure of the toxicants were also studied.

MATERIALS AND METHODS

Gafrarium divaricatum (Gmelin) were collected during low tide period from Nanman Point area of Bombay Coast and after cleaning with sea water brought to the laboratory as single stock. The clams were acclimated for 24 hours in a medium-sized aquarium (60x30x30 cm) containing sea water with salinity 30-32 ppt, temperature 27-29°C, dissolved oxygen 6.3-8.0 mg/l and pH 7.7-8.0. The same conditions were maintained throughout the bioassay tests. No special food was given to the clams as these animals thrived well under laboratory conditions. The sea water used during acclimation and experimentation was brought from same place of the coastal area. Only those sets of stock animals which did not show any mortality during the acclimation period were used for the acute toxicity experiments. The active clams of more or less uniform size (30-32 mm) were selected for the bioassay experiments. The clams with protruding siphon and foot were considered as active clams. For purpose of acute toxicity experiments, the static exposure procedure was followed as recommended by APHA (1980).

The clams to be exposed to xylene and benzene as well as gear oil-WSF and mobile oil-WSF were kept in thoroughly cleaned glass aquaria (20x15x15 cm) each containing one litre of sea water and 10 clams. Bioassay tests were carried out for the period of 24, 48, 72 and 96 h. Physical and chemical characteristics of test water were determined using standard methods (Barnes, 1959; Strickland and Parson, 1975). The aquarium water was replaced by freshly collected sea water at every 24 h with appropriate addition of fresh test toxicant. Standard solutions of the hydrocarbons were prepared in acetone. Aliquots of these stock hydrocarbon solutions were added to the experimental aquaria water to obtain the desired concentrations. Sets of the clams were kept as controls under the same experimental conditions except that no toxicant was added in the aquaria. Only acetone was added in equal quantities used for the aliquots.

The oil used for present bioassay studies is in the form of water soluble fraction (WSF) which was prepared by adding 500 ml of test oil to 500 ml of sea water. The mixture was stirred with an electric stirrer in a closed container for 24 h at 2000 rpm. After mixing the oil and water layers were allowed to separate for 6 h and then the water phase at bottom was siphoned off and utilized immediately for the experimentation. The obtained WSF was considered as 100% WSF and added to test tanks to get desired concentration. The control sets of animals kept for gear oil experiment were without addition of any chemical.

To observe and study the symptoms of intoxication and general behaviour of clams, the acute toxicity experiments were started early in the morning. Mortality in each medium was recorded up to 96 h at the intervals of 24 h. The clams whose shell valves remained open even after prodding with a glass rod were considered dead.

LC_{50} values for 24, 48, 72 and 96 h were determined by graphical interpolation (Litchfield and Wilcoxon, 1949). The confidence limits are merely indicators of what might be expected if the same stock of animals were immediately retested under identical conditions. It can be expected that bioassays with similar animals at different times of year will give somewhat different LC_{50} values. The slope function has been included with the LC_{50} values of Table and represents the factor by which a dose must be multiplied or divided to produce a standard deviation change in response. Thus, large "S" values are indicative of large standard deviations in the test results and produced rather broader 95% confidence limits.

For histopathological studies, the clams were exposed to chronic concentrations of xylene (4.25 and 8.50 mg/l), benzene (4.35 and 8.70 mg/l) and gear oil-WSF (1 and 2%) for 30 days. They were dissected to remove hepatopancreas and gills and the tissues were fixed immediately in freshly prepared Bouin's solution. After 24 h, they were washed thoroughly in running tap water, dehydrated in ascending series of alcohol, cleared in xylene and embedded in paraffin wax at 60°C. Serial sections were cut at 7 µm on rotary microtome and stained in hematoxylin and eosin (H&E). The histopathological changes in both the tissues of the experimental as well as control clams were recorded.

RESULTS AND DISCUSSION

The results of acute toxicity tests following static bioassay procedures showed that xylene is more toxic than benzene and gear oil-WSF is more toxic than mobile oil-WSF to *G. divaricatum* (Table 1). The large variations in between 24 and 96 h LC_{50} of these pollutants to intertidal clams indicate that closing of the shell valves is beneficial to avoid higher concentration of pollutants in their surrounding medium.

Since oil-water mixture (OWM) with less dose of oil was not tolerated for longer duration by *G. divaricatum*, the water soluble fraction (WSF) of gear and mobile oil and sub-lethal concentrations of xylene and benzene were used during chronic toxicity studies based on the LC_{50} to the clams as well as concentration of petroleum hydrocarbons detected in the Arabian sea. General behaviour of the clams gets adapted to the contaminated media whereas burrowing activity are inhibited in varying degrees. The combined effect of lower salinity and oil-film (OWM) markedly inhibited their burrowing behaviour. The oxygen consumption and filtration rates in the clams depleted due to stress of the pollutants after one month of exposure.

The histopathological damage in hepatopancreas of *G. divaricatum* elicited by xylene, benzene and gear oil-WSF included the loss of bubbling epithelium, reduction in cytoplasm volume and density, fusion of cell membranes and nuclei forming darkly stained area at basal part of the cells. Damage of basement membrane due to disintegration

Table 1: LC_{50} values of xylene, benzene and WSFs of gear and mobile oil for *Gafrarium divaricatum*

Pollutant	Methods	24 hours	48 hours	72 hours	96 hours
Xylene	LC_{50} (mg/l)	1280	1160	780	720
	95% C.I.	(1638-1000)	(1462-920)	(1087-559)	(1052-492)
	Slope F	1.63	1.45	1.70	1.84
Benzene	LC_{50} (mg/l)	1720	1480	1200	960
	95% C.I.	(2046-1445)	(1885-1161)	(1452-991)	(1353-680)
		1.49	1.61	1.48	2.22
Gear oil-WSF	Slope F	65	55	35	25
	LC_{50} (%WSF)	(75.40-56.03)	(66.00-45.83)	(48.30-25.36)	(38.00-16.44)
	95% C.I.	1.34	1.43	1.90	2.61
Mobile oil-WSF	Slope F	70	64	45	30
	LC_{50} (%WSF)	(79.80-61.40)	(73.60-55.65)	(56.70-35.71)	43.50-20.68)
	95% C.I.	1.31	1.34	1.59	2.09
	Slope F				

of epithelial cells, disruption of inner lining of tubule, formation of necrotic spaces, separation of epithelial cells from basement membrane, change in shape of epithelial cells, increase in internal luminar area, complete necrosis of epithelial cells as well as formation of debris and occurrence of cell debris in between the tissue were also observed in the clams due to chronic exposure of toxicants (Fig. 1-4).

Marked atrophy of digestive cells and reduced membrane stability were observed in the bivalve, *Venus verucosa*, exposed to petroleum hydrocarbons (Axiak *et al*., 1988). Similar histopathological changes were observed in hepatopancreas of *Mya truncata* when exposed to petroleum hydrocarbons. Severe necrosis of digestive epithelia and replacement of collagenous cords have also been reported in clams exposed to N-nitroso compounds (Rasmussen, 1982; Rasmussen *et al*., 1983a, b; 1985). Furthermore, the clams exposed to copper showed reduction in epithelial cells, loss of cytoplasmic density, vacuolization as well as disintegration of epithelial cells and atrophy of digestive tubules (Roy, 1994; Au, 2004).

The histopathological changes in gills (ctenidia) of the clams exposed to xylene, benzene and gear oil-WSF included widening of ectal spaces, vacuolization of basal part of filaments, sloughing off the ciliary portions and skeletal rods of gill filaments, lysis of epithelial cells and epithelial layer, complete lysis of gill filaments and development of necrotic tissue, change in regular tubular shape of filaments, loss of inter-filamental junctions, invasion of hemocytes and widening of inter-filamental space. The histopathological changes in both the tissues were most prominent in clams exposed to higher concentration of xylene (8.5 mg/l) (Fig. 5-8).

Disruptive histopathological changes in gills of some crustaceans exposed to petroleum hydrocarbons have been recorded (Kulkarni, 1983; Deshmukh, 1983; Dange and Masurekar, 1985; Au, 2004). Moreover, swelling and degeneration of mucous secretory cells and necrosis of gill filaments have also been observed in bivalves under stress of zinc and copper (Hietanen *et al*., 1988; Auffret, 1988; Roy, 1994). These findings support the observed histopathological damage in gills of *G. divaricatum*

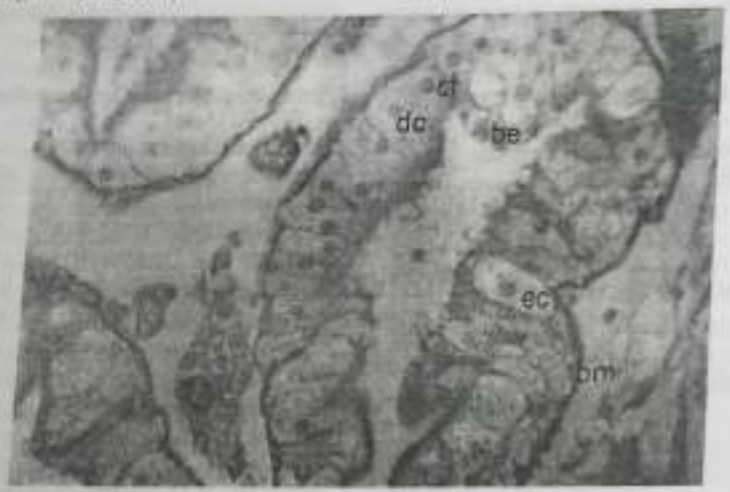

Fig. 1. Main duct of hepatopancreatic tubule of control *Gelfarium divaricatum* showing epithelial cells (ec), ciliated typhlosoles (ct), bubbling epithelium (be), basement membrane (bm) and digestive cells (dc). H&E. x 400.

Fig. 2. Main and secondary duct of hepatopancreatic tubule of xylene (8.5 mg/l) treated clam showing loss of bubbling epithelium (be), detachment of epithelial cells from basement membrane (dcb), disintegration of basement membrane (dbm) and fusion of epithelial cells (fe) as well as nuclei (fn). H&E. x 400.

Fig. 3. Main and secondary duct of hepatopancreatic tubule of benzene (8.7 mg/l) treated clam exhibiting formation of syncytium layer of nuclei at the periphery of the tubule (sn), fusion of nuclei (fn) and infiltration of hemocytes (ih). H&E. x 250.

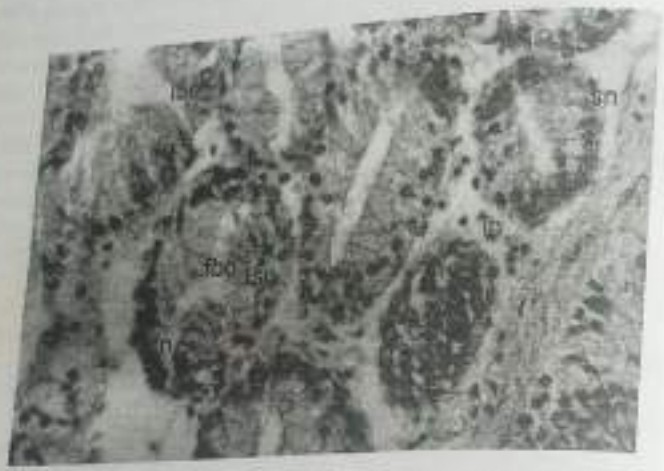

Fig. 4. Main and secondary duct of hepatopancreatic tubule of gear oil-WSF (2%) treated clam depicting fusion of bubbling epithelium of opposite sides (fbo), formation of syncytium layer of nuclei (sn), loss of bubbling epithelium (lbe), infiltration of hemocytes (ih), fusion of nuclei (fn) and loss of regular shape of epithelial cells (lse). H&E. x 400.

5. Gill of control *Gafrarium divaricatum* showing gill filament (f), epithelial cells (ec), cilia (c) and ostia (o). H&E. x 250.

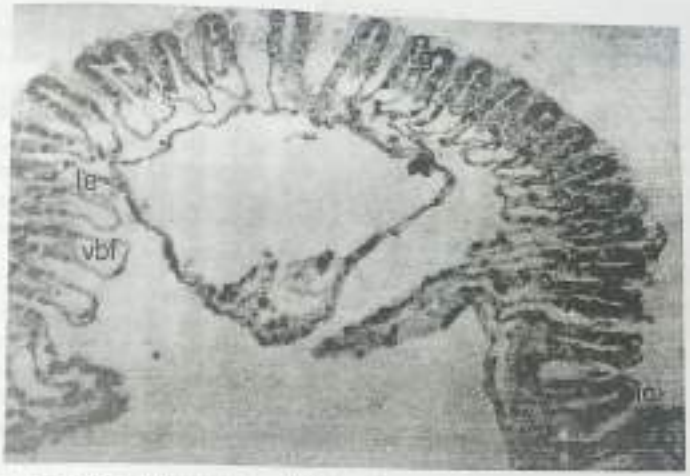

Fig. 6. Gill of xylene (4.25 mg/l) treated clam exhibiting damaged gill filaments with vacuolization of basal part of gill filament (vbf), fusion of gill filaments (fg) and loss of cilia (lc) as well as epithelial layer (le). H&E. x 250.

Fig. 7. Gill of benzene (8.7 mg/l) treated clam showing damaged gill filaments (df), loss of structural integrity of filaments with vacuolization of basal part of gill filaments (vbf), fusion of epithelial cells (fe), infiltration of hemocytes (ih) and loss of cilia (lc) as well as epithelial layer (le). H&E. x 250.

Fig. 8. Gill of gear oil-WSF (2%) treated clam exhibiting loss of cilia (lc), vacuolization of basal part of filaments (vbf), widening of inter-filamental spaces (wif), loss of epithelial layer (le) and infiltration of hemocytes (ih). H&E. x 250.

exposed to xylene, benzene and gear oil-WSF. In conclusion, the low concentration of petroleum hydrocarbons and WSF of gear oil do not kill the exposed clams but still adversely affect their general well-being thus reducing their ability to adapt to varied environmental conditions and become more prone to pathogens.

REFERENCES

APHA 1980. *Standrad Methods for Examination of Water and Wastewater*. 15th edn. American Public Health Association, Washington, D.C. pp. 615-646.

Au, D.W.T. 2004. The application of histo-cytopathological biomarkers in marine pollution: a review. *Mar. Pollut. Bull.*, 48: 817-834.

Auffret, M. 1988. Histopathological changes related to chemical contamination in *Mytilus edulis* from field and experimental conditions. *Mar. Ecol. Prog. Ser.*, 46: 101-107.

Axiak, V.; George, J.J. and Moore, M.N. 1988. Petroleum hydrocarbons in the marine bivalve, *Venus verrucosa*: accumulation and cellular responses. *Mar. Biol.*, 97: 225-230.

Barnes, H. 1959. *Apparatus and Methods of Oceanography. Part I. Chemicals*. George Allen & Unwin Ltd., London, 341 p.

Boylan, D.B. and Tripp, B.W. 1971. Determination of hydrocarbons in sea water extracts of crude oil and crude oil fractions. *Nature*, 230: 40-47.

Capuzzo, J.M. and Lancaster, B.A. 1982. Physiological effects of petroleum hydrocarbons on lobsters (*Homarus americanus*). Hydrocarbon accumulation and interference with lipid metabolism. In: *Physiologiocal Mechanisms of Marine Pollutant Toxicity* (W.B. Vernberg; A. Calabrese; F.F. Thurberg and F.J. Vernberg). Academic Press, New York. pp. 477-501.

Chapman, P.M. and Long, E.R. 1983. The use of bioassays as part of a comprehensive approach to marine pollution assessment. *Mar. Pollut. Bull.*, 14 (3): 81-84.

Dange, A.D. and Masurekar, V.B. 1985. Acute toxicity of petroleum hydrocarbons to the estuarine fish, *Therapon jarbua* (Forskal) and the estuarine clam, *Katelysia opima* (Gmelin). *J. Mar. Biol. Assoc. India*, 6: 828-832.

Deshmukh, N. 1983. Some aspects of toxicity of petroleum hydrocarbons to the speckled prawn, *Metapenaeus monoceros* (Fabricius). *Ph. D. Thesis*, University of Bombay, Bombay.

Hietanen, B.; Sunila, I. and Christoffersson, R. 1988. Toxic effects of zinc on common mussel, *Mytilus edulis* (L.) (Bivalvia) in brackishwater. I. Physiological and histopathological studies. *Ann. Zool. Fenn.*, 25: 341-347.

Kulkarni, B.G. 1983. Toxicity studies: effects of some petroleum hydrocarbons on some marine animals. *Ph.D. Thesis*. University of Bombay, Bombay.

Litchfield, J.I. and Wilcoxon, F. 1947. A simplified method for evaluating dose-effect experiments. *J. Pharmacol. Exp. Ther.*, 96: 99-113.

NRC 2003. *Executive Summary: Oil in the Sea III. Inputs, Fates, and Effects*. National Academy of Sciences (USA), Washington, D.C.

Rasmussen, L.P.D. 1982. Light microscopical studies of the acute effects of N-nitrosodimethylamine on marine mussel, *Mytilus edulis*. *J. Invert. Pathol.*, 48: 117-123.

Rasmussen, L.P.D.; Hage, E. and Karlog, O. 1983a. Light and electron microscopic studies of the acute and chronic toxic effects of N-nitrosocompounds on marine mussel, *Mytilus edulis* (L.). I. N-nitrosodimethylamine. *Aquat. Toxicol.*, 3: 285-299.

Rasmussen, L.P.D.; Hage, E. and Karlog, O. 1983b. Light and electron microscopic studies of the acute and chronic toxic effects of N-nitroso compounds on marine mussel, *Mytilus edulis* (L.). I. N-methyl, N-nitro, N-nitrosoguanidine. *Aquat. Toxicol.*, 3: 301-311.

Rasmussen, L.P.D.; Hage, E. and Karlog, O. 1985. Light and electron microscopic studies of the acute and long-term effects of N-nitrosodipropylamine and N-methyl nitrisurea on marine mussel, *Mytilus edulis* (L.). *Mar. Biol.*, 85: 55-65.

Roy, S.S. 1994. Effects of copper on ecophysiological aspects of the clam, *Gafrarium divaricatum*. *M.Sc. Thesis*. University of Bombay, Bombay.

Sen Gupta, R.; Fondekar, S.P. and Alagarsamy, R. 1993. State of oil pollution in the Northern Arabian Sea after the 1991 Gulf Oil Spill. *Mar. Pollut. Bull.*, 27: 85-91.

Sprague, J.B. 1973. The ABC's of pollutant bioassay using fish. In : Biological Methods for the Assessment of Water Quality. *Am. Soc. Test Mater. Tech. Pub.*, 528: pp. 6-30.

Strickland, J.D. and Parson, T.R. 1975. *A Practical Handbook of Sea Water Analysis*. Bull. Fish. Res. Bd. Canada. pp. 167-310.

Suchanek, T.H. 1993. Oil impacts on marine invertebrate populations and communities. *Amer. Zool.*, 33: 510-523.

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EFFECT OF FOLIAR APPLICATION OF UREA AND PLANT GROWTH REGULATORS ON FRUIT RETENTION AND YIELD OF MANGO (*MANGIFERA INDICA* L.) CV LANGRA

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ABSTRACT

Data indicate the hormone/chemical suitable for better fruit retention and yield of mango fruit .All the treatments proved better over control in the experiment .The maximum number of fruit retention per panicle (1.52 and 1.83) was recorded with 50 ppm of BA (benzyl adenine) application in both the years. The interaction effects were much superior to single application and the values were observed significantly higher (1.79 and 2.09)with a combination of 2% urea and 50 ppm BA in both the years. Similar trend was also found with yield parameter. The maximum yield (324.63 and 333.48 g per panicle)was recorded with 50 ppm BA when applied singly. In interaction effect the significantly higher values (352.64 and 367.30 g per panicle) were recoded with 2% urea and 50 ppm BA in both the years respectively.

Key words: *Urea, Benzyl adenine, GA_3 PGR, growth , yield ,mango.*

The mango (*Mangifera indica* L.) is the most popular and choicest fruit produced in tropical regions of the world, particularly in India. Shedding of immature fruits is a common phenomenon in almost all the commercial mango varieties reaching even over 99 percent (Naik *et al.*, 1943, Mukharjee 1949 and Chadda *et al.*, 1963) .The cultivar Langra also prone to fruit shedding and lower yield due to complex causes. Effect of chemicals like urea ,GA_3 and BA was found encouring to control fruit drop and enhancing yield per plant when applied in different stages as foliar spray. Keeping these aspects in view, the experiment was conducted to ascertain the effect of chemicals on retention and yield of mango fruit .

MATERIALS AND METHODS

The experiment was conducted at Horticulture Research Farm in the Department of Horticulture at B.H.U. Varanasi (U.P). with a view to standardize suitable chemical for better retention and yield of mango fruit. The details of the experiment are as follow:

Fifteen treatment combinations were formed from three levels of urea No, N_1, N_2 (0.0, 1.0 and 2.0 percent), two levels of GA_3 *i.e.* G_1 and G_2 (50 and 100 ppm) and two levels of benzyl adenine, B_1 and B_2 (25 and 50 ppm) with a control. The chemicals were applied as foliar spray individually .There were fifteen treatment combinations in each replication. Randomized Block Design under factorial experiment with three replications was adopted. A tree was used as unity in each replications to apply a particular treatment. The interaction treatments of nutrient and growth regulators were given singly. The observation on fruit retention and yield were collected as given in Table 1 and 2.

RESULTS AND DISCUISSION

The data of fruit retention given in Table1 reveal that both the nitrogen (urea) and plant growth

Table 1: Effect of foliar application urea and growth regulators on number of fruit retention per panicle in mango

Treatment	N_0	N_1	N_2	SEM±	CD at 5%	C	G_1	G_2	B_1	B_2	SEM±	CD at 5%
1st	0.73	0.96	1.2	0.123	0.272	0.56	0.96	1.28	1.06	1.52	0.043	0.277
2nd	1.05	1.27	1.5	0.05	0.269	0.86	1.26	1.53	1.35	1.83	0.042	0.274

Treatment	C	N_1G_1	N_1G_2	N_1B_1	N_1B_2	N_2G_1	N_2G_2	N_2B_1	N_2B_2	SEM±	CD at 5%
1st	0.23	0.12	1.27	1.06	1.52	1.23	1.53	1.31	1.79	0.049	0.295
2nd	0.54	1.26	1.63	1.35	1.83	1.47	1.88	1.58	2.09	0.22	0.292

Table 2: Effect of foliar application of urea and growth regulators on fruit yield (g) per panicle in mango

Treatment	N_0	N_1	N_2	SEM±	CD at 5%	C	G_1	G_2	B_1	B_2	SEM±	CD at 5%
1st year	259.09	285.18	304.58	0.913	2.623	250.68	285.71	304.04	290.12	324.63	1.118	3.212
2nd year	263.58	287.22	309.99	0.873	2.508	257.01	286.97	309.52	292.43	333.48	1.069	3.071

Interaction effect

Treatment	C	N_1G_1	N_1G_2	N_1B_1	N_1B_2	N_2G_1	N_2G_2	N_2B_1	N_2B_2	SEM±	CD at 5%
1st year	256.28	265.52	285.61	289.5	313.11	314.8	327.87	315.52	352.64	1.581	4.542
2nd year	229.52	269.24	292.81	275.32	320.31	316.96	334.29	319.18	367.3	1.512	4.344

regulators (GA_3 and BA) increased the fruit retention at all level of concentration as compared to control. Among the first order interactions, N_2 x B_2 (2 percent urea x 50 ppm BA) had shown the maximum number of fruit retention, *i.e.* 1.79 and 2.09 fruit per panicle and minimum was 0.23 and 0.54 fruit per panicle in control in both the years of experiment. Among the single application, BA (50 ppm) was found superior (1.52 and 1.83 fruit per panicle) to other treatments. The lowest values (0.56 and 0.86 fruit per panicle) were recorded with control in both the years of experiment. The ascending order in terms of number of fruit per panicle was observed as B_2>G_2>N_2>B_1>G_1>N_1>C in single application and B_2N_2>G_2N_2>B_2N_1>G_2N_1>N_2C in interaction effect. Higher level of chemicals yielded better results indicating the role of nitrogen, cytokine (BA) and gibberellic acid during fruit set and development. Nitrogen being structural part of plant system influenced greatly with cytokinin in retention of the fruit. This result also indicates that during fruit set and development, higher level of nitrogen and hormones are required. Baghel *et al.* (1986) also reported that urea 6% +150 ppm NAA and urea 4%+ 120 ppm NAA resulted in higher % of fruit retention until harvest. Rajput and Tiwari (1975) observed similar findings with urea application in Langra cv. of mango. The yield parameter also followed the similar trend and in the first order interactions the maximum yield of fruit was recorded under N_2 x B_2 combination *i.e.* 352.64 g and 367.30 g per panicle followed N_2xG_2 *i.e.* 327.87 g and 334.29 g per panicle in both the years, respectively.

Individually, the maximum fruit yield per panicle was recorded at the higher level of chemicals as urea 2% (304.58 g and 309.90 g per panicle) GA_3 100ppm (304.04 g and 309.52 g per panicle) and BA 50 ppm *i.e.* 324.63 g and 333.84 g per panicle in both the years, respectively. The useful results obtained by urea in combination with BA is due to the beneficial effect of each factor. These findings are in agreement with the results of Rajput and Singh (1983) in mango and Rajput and Singh (1976) in ber.

Based on the findings of the studies, it may be summarized that for better fruit retention and yield of Langra cv of mango fruit, urea 2% and benzyl adenine 50 ppm should be sprayed in December and March PGR in January and March of urea keeping 10 days interval between factors.

REFRENCES

Chadda, K.L. and Singh K. 1963 Effect of NAA ,2, 4-D and 2, 4, 5-T on fruit drop, size, quality of Langra mango *Indian J. Hort.* 20(1):30-33.

Mukherjee, S.K. 1949 The taxonomic value of the the anatomical structures of the inflorescence of mango (*Mangifera indica* L.). *J. Indian Bot. Soc.* 28:162-171.

Naik, K.C. and Rao M.M. 1943 Studies on blossom biology and pollination in Mangoes (*Mangifera indica* L.) *Indian J. of Hort.* 1 (2): 107-19.

Rajput, C.B.S. and Singh, J.N. 1983 Effects of urea and GA_3 sprays on growth, flowering and fruiting characters of mango. *Prog. Hort.* 15: 174-177.

Rajput, C.B.S. and Singh J. 1976 Effect of urea sprays and GA_3 on the growth and fruiting of ber (*Zizyphus mauritiana* Lam.) *J. Hort. Sci.*, 51 (1): 173-176.

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IMMUNO-PATHOLOGICAL CHANGES IN SECONDARY LYMPHOID ORGAN OF WHITE LEGHORN CHICKS INDUCED BY EXPERIMENTAL ASCARIDIASIS

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ABSTRACT

Histopathological alterations in the secondary lymphoid organ (spleen) of WLH chicks infected with *A. galli* were recorded on day 7, 28 and 63. The spleen of infected chicks showed lymphoid hyperplasia in white pulp area, red pulp tissue revealed dilated and congested venous sinuses but there was no change observed in capsule after 7 days post-infection. After 28 days post-infection, the spleen showed capsular wall thickened at some places and irregular in shape, RBCs and few lymphocytes were found infiltrated in the capsular wall. The number of vessels increased in white pulp. Hyperplasia with congested sinuses was observed in red pulp tissue. After 63 days post-infection, these changes were more severe as evident by the thickened, ruptured as well as non-inflammatory edema in the capsular wall at certain places. The white pulp tissue revealed complete depletion of lymphocytes, hyperplasia with congested sinuses, complete absence of lymphocytes and more dilated venous sinuses in red pulp.

Key words: A. galli infection, Spleen histopathology, White-leg horn chicks.

Nematodes are one of the most common pathogens which disturb the whole economic status of poultry industry. Chickens are highly susceptible to *Ascaridia galli* infection which causes the disease "ascariasis" (Freeborn, 1923; Movsesyan and Pkhrikyan, 1984; Chauhan, 2002). Over the ages, poultry has acquired a major share of the economy of nations as well as for the small-scale farmers. *Ascaridia galli* shows various degrees of pathogenecity. When they are more in numbers, the chicks show malnutrition, retarded growth and weakness of bones. Protective immunity against *Ascaridia galli* in chicks can be achieved either by passive or by active immunization.

Thymus and bursa of Fabricius constitute primary lymphoid organs while spleen performs the role of a secondary lymphoid organ. Thymus and bursa of Fabricius are necessary to the antigenic development of adoptive immunity (Warner and Szenberg ,1964; Clawson *et. al.* 1967). As spleen is a secondary lymphoid organ but very important structure indicating disease pattern of the animal. Glick and Sato (1964) and Lewis and Wilson (1980) stated that follicles or nodules of small lymphocytes were not seen in the spleen but they termed "secondary nodules" composed mainly of medium or large lymphocytes. Langevoort (1963) observed in mammals that antigenic stimulation results in histological changes in lymph nodes and spleen. Vincent (1976) and Vincent and Ash (1978) studied the chronological development of pulmonary splenic and lymphoid lesions in male and female meriones infected with *Brugia malayi*. Pues and Chieffi (1978) observed malnutrition effect on the lymphoid organs of some children due to disseminated strongyloidiasis. D'yachenko *et al.* (1993) reported morphological changes in lymphoid organs in mice due to *T. spiralis* infection.

MATERIALS AND METHODS

White leg-horn chicks (WLH) used in the present study were bought from M/S Salim Hatchery House, Meerut. Chicks were acclimatized to laboratory condition for about a week before initiating the experiment. The adult female parasites, *Ascaridia galli*, were collected from infected WLH chicks. The parasites were kept in watch glass filled with saline solution for natural egg laying at 37° C for 24 hours. Eggs were obtained by teasing the distal part of body of the parasite. They were kept in saline water for healthy embryonation. The saline water was changed periodically and 1.0% formalin added to culture medium to avoid the eggs from fungal contamination. Experimental infection was induced in the healthy male and female chicks with 500 embryonated eggs of nematodes (Chauhan, 2002; Rubela *et al.*, 2006, 2007) WLH chicks from the experimental as well as control groups were killed on day 7, 28 and 63. Spleen were surgically removed and fixed immediately in freshly prepared 10% formalin. After routine processing in ascending series of alcohol and clearing in xylene, the tissues were embeded in paraffine wax at 60° C. Serial sections were cut at 6 µm and stained in haematoxylin and eosin for histopathological examinations.

RESULTS AND DISCUSSION

Spleen of the control WLH chicks consisted mainly of capsule, subcapsule, white pulp and red pulp. The splenic capsule was found to be regular in shape and surrounded externally by a thin layer of peritoneal mesothelium. The subcapsule comprised white pulp and red pulp. The white pulp area was found to be diffused network of tissue. There were splenic arteries and number of small-sized scattered lymphocytes. The red pulp was observed to be a loosely packed spongy tissue. There were irregularly spread passage of venous sinuses (Fig.1, 5, 8). Spleen of the WLH chicks infected with *A. galli* showed capsular wall normal or regular in shape. There was no change in this portion while slight differences were observed in the number of lymphocytes within the white pulp area. Larger vessels (arteries) were present and well-marked lymphoid hyperplasia observed. The red pulp tissues revealed dilated and congested venous sinuses where few vessels were sclerosed after 7 days post-infection (Fig. 2, 3, 4). After 28 days post-infection, the spleen exhibited capsular wall thickened at some places and irregular in shape. Here evident change was found in capsular wall that large number of red blood corpuscles and few lymphocytes were focally infiltrated in the capsular wall. The white pulp revealed increased number of blood vessels and some of them were sclerosed. Mild depletion of lymphocytes and hyperplasia with congested sinuses at certain places were also observed in red pulp tissues (Fig. 6, 7). After 63 days post-infection, the pathological changes were ruptured capsule wall at certain places and slightly thickened non-inflammatory edema in outer and inner layer of capsular wall. The white pulp tissues revealed complete depletion of lymphocytes and well-marked presences of few eosinophils and plasma cells. The transformed lymphocyte was also observed. Depletion of lymphocytes prominent and hyperplasia with congested sinuses was also revealed in the red pulp and complete absence of lymphocytes was observed with more and more dilated venous sinuses (Fig. 9, 10, 11).

Non-inflammatory edema was found in present investigation. This was possibly due to storage of water in the capsular wall. The result of present investigation conformed only in 63 days post-infected chicks. Matta (1980) and Chauhan (2002) reported histopathological changes like gross petechical lesion in the intestine and generalized edema in chicks infected with *A. galli*. Poletaeva (1978) and Abdulazizov (1984) noticed pathological changes in spleen of mice infected with *A. suum*.

The present observation revealed a progressive depletion of lymphocytes leading to total depletion in the 63 days infected chicks. Both the immune responses depend upon the lymphocytes because these play central role. The depletion of lymphocytes may be due to in developing immunity chronic drainage of lymph from the thoracic duct. Capsular thickening, congestion and dilation of venous sinuses in red pulp area were also found as a most

important pathological changes. The present investigation revealed infiltration of lymphoid cells in the capsular wall. This striking changes was observed only in the 28 days infected chicks. Vincent and Ash (1978) reported plasma cell infiltration in some long-term infection by *B. patei* in the birds.

The histological observation in spleen indicating immunopathological changes is of great significance. *A. galli* is an intestinal parasite after very brief intramucosal life. The histopathological alterations observed in spleen must be related with the antigens or toxins released by the parasite which through the blood system reaches to the spleen causing changes in the capsular wall and depletion in lymphocyte count. The spleen lymphocytes are concerned with cell-mediated immunity and any depletion of lymphocyte may be taken as T4 lymphocyte. The normal count of lymphocyte in spleen without any suppression would help in providing immunity to the host. Wolfe *et al.* (1962) and Edwards *et al.* (1975) observed growth of lymphoidal organs in chicken.

Fig. 1. Spleen of seven days old control WLH chick showing capsular (→) and subcapsular region (↑). x100

Fig. 2. Spleen of seven days old PI WLH chick showing capsular wall (→) red pulp area. (x400)

Fig. 3. Spleen of seven days old PI WLH chick showing white pulp area ( ) x80.

Fig. 4. Spleen of seven days old PI WLH of venous sinuses in red pulp area x100.

Fig. 5. Spleen of twenty eight days old control WLH chick showing white pulp ( ) x100.

Fig. 6. Spleen of twenty eight days old PI WLH chick showing infiltration of red blood corpuscles ( ) in large number and with few lymphocytes in capsular wall ( ) x100.

Fig. 7. Spleen of twenty eight days old PI WLH chick showing capsular wall as well as red pulp area with hyperplasia and congested sinuses ( ) x400.

Fig. 8. Spleen of sixty three days old control WLH chick showing white pulp area ( ) as well as red pulp area ( ) x100.

Fig. 9. Spleen of sixty three days old PI WLH chick showing thickening of capsular wall ( ) having non-inflammatory edema ( ) x100.

Fig. 10. Spleen of sixty three days old PI WLH chick showing more and more dilation ( ) of venous sinuses and hyperplasia of lymphoid cells in low magnification x100.

Fig. 11. Spleen of sixty three days old PI WLH chick showing complete depletion ( ) of lymphocytes. x100.

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REFERENCES

Abdulazizov, A.I. 1984. Pathological and histochemical changes in the organs of mice infected with *Ascaris sum*. In: Gel'mintozy cheloveka (Respublikanskii sbornik Nauchnykh Trudov) no. 2. Leningrad, U.S.S.R.

Chauhan, D. K. 2002. Immunopathological studies in experimental ascondiasis with heavy metal toxicity in W.L.H. chick. *Ph.D. Thesis*. C.C.S. University, Meerut, India.

Clawson, C.C., Cooper, M.D. and Good, R.A. 1967. Lymphocyte fine structure in the bursa of Fabricius, the thymus and the germinal centers. Lab. Investig. 16: 407-421.

D'yachenko, G.N., Pereverzeva, E.V. and Vavetsmirkova, N.G. 1993. Morphological changes in the organs of the lymphoid system in mice with experimental *Trichinella spiralis* infection. *Meditsinskaya Parazitologiya i parazitarnye Bolezni*, 3: 48-50.

Edwards, J.L., Murphy, R.C. and Cho, Y. 1975. On the development of the lymphoid follicles of the bursa of Fabricius. *Anat. Rec.*, 181: 755-753.

Fredborn, S.B. 1923. Nicotine is a poultry vermifuge. *Science*, 51:693.

Glick, B. and Sato, K. 1964. Accessory spleens in the chickens. *Poult. Sci.*, 43:1610-1612.

Langevoort, H.L. 1963. The histophysiology of the antibody responses. Histogenesis of the plasma cell reaction in rabbit spleen. *Lab. Invest.* 12: 106-118.

Lewis, F.A. and Wilson, E.M. 1980. Murine spleen cell suppressor activity induced by *Schistosoma mansoni* cercarial membrane antigens. Fed. Proc. of Am. Soc. Exp. Bio., 38 (3): 677.

Mattu, S.C. 1980. Studies on the effects of *Raillietina* spp. on some haematological indices of fowl. *Indian J. Poult. Sci.*, 15: 273-274.

Movsesyan, S.O. and Petrikyan, L.V. 1984. Ecological features of *Ascaridia galli* in experimentally infected chickens. *Materialy Nauchnoi Konferentsii Vsesoyuznog Ob shchestva gel Mmnologov*, 34: 41-46.

Pare, R.A.P. and Chieffi, P.P. 1978. Morphological evaluation of cell populations in the lymphoid organs of children with malnutrition due to disseminated *Strongyloidiasis*. *Avaliacao morfologica de populacoes celulares de organs linfoides en cricmcudes nutridos comestrongiloidiase disseminada* (30 a Reuni). *An. Soc. Bras. Prog. Clinc Abstract*, 140: 1-10.

Poletaeva, O.G. 1978. The phenomenon of rosette formation by β- Lumphocytes in the spleen of mice infected with *Ascaris sum* larvae. *Meditsinskayei parazitologiyai parazitarny bolezni*. 47 (4): 34-38.

Rubela, Shashi; Pandey, A.K. and Khare, A.K. 2006. Histopathological changes in intestine of *Clarias batrachus* induced by experimental *Procamallanus* infection. *J. Ecophysiol. Occup. Health*. 6(1): 111-117.

Ruhela, Shashi; Pandey, A.K. and Khare, A.K. 2007. Histopathological changes in liver of freshwater catfish *Clarias batrachus* (Linnaeus) induced by experimental *Procamallanus* infection. *J. Appl. Biosci.*, 33(1): 36-41.

Vincent, A.L. 1976. A histological evaloution of the Mangolian bird in experimental lymphatic filariasis. *Dissertation Abstracts International* 37B(4) : 1631-1632.

Vincent, A.L. and Ash, L.R. 1978. Splenomegaly in bird infected with *Brugia malayi* and related species. *American J. Trop. Med. and Hyg.*, 27(3): 514-520.

Warner, N.L. and Szenberg, A. 1964. The immunological function of bursa of Fabricius in the chicken. *Ann. Rev. Microbial.*, 18: 253-266.

Wolfe, H.R.; Sheridan, S.A.; Bilstad, N.M. and Johnson, M.A. 1962. The growth of lymphoidal organs and the testes of chickens. *Anat. Rec.* 142: 485-493.

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EFFECT OF PRESERVATIVE AND SUGAR LEVEL ON TSS AND SHELF LIFE OF GUAVA (*PSIDIUM GUAJAVA* L.) CV. ALLAHABAD SAFEDA JUICE.

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ABSTRACT

Data indicated the effect of preservative and sugar level on TSS and shelf-life of guava juice. Three levels of preservative (P_0, P_1, P_2-0, 500, 600 ppm respectively) and sugar (S_0, S_1, S_2 -0, 15, 20% respectively) were tried to find out better TSS with acceptable shelf-life of guava juice. The maximum TSS (23.10) was recorded in P_2S_1 (SB 600 ppm + sugar 15% + guava juice) treatment after 120 days of storage. The minimum TSS (7.33%) was observed in P_0S_1 (without preservative and sugar +Guava juice) treatment. Higher level of sugar (20%) does not influenced the TSS% during the storage and found significantly inferior to the better sugar level (15%). Organoleptic quality was found to acceptable up to 120 days in terms of texture, colour, taste, appearance and overall acceptability. The treatment P_2S_1' was also found best with reference to acceptability (8.00 score) when stored at ambient temperature. The poorest result (4.67 score) was observed with control. On the basis of results obtained it may be concluded that treatment combination P_2S_1(SB 600 ppm +sugar 15%+guava juice) may be recommended for commercial production of guava juice at ambient temperature storage up to 120 days.

Key words : Guava, juice, TSS organoleptic, sugar, sodium benzoate (SB).

Guava (*Psidium guajava* L.) is one of most important subtropical fruits of India and ranks fourth in position after mango, banana and citrus. It is very delicious and nutritious and rightly called the "apple of the tropics". This is one of the rarest fruit which can produce three crops in a year. Unfortunatly, this fruit is very perishable in nature and can not be stored longer without heavy deterioration and spoilage. Farmers always have uncertainty about selling of fruits at premium price. Guava juice is very nutritious and refreshing drink which can be preserved and consumed in the off-season. The quality of juice is influenced by several factors among which preservative and sugar levels affects dominantly. Keeping these aspects in view, the juice of guava fruit was prepared and preserved with different levels of SB and sugar to find out better TSS and organoleptic quality with maximum duration of storage.

MATERIALS AND METHODS

The experiment was conducted with different levels of sodium benzoate (SB) and sugar to find out better TSS and shelf-life of guava juice at post harvest laboratory, Deptt of Horticulture, KAPG College, Allahabad (UP). There were two factors *ie.* (a) preservative (P_0, P_1, P_2 at 0, 500 and 600 ppm SB) and (b) sugar (S_0, S_1, S_2 at 0,15 and 20%) with 9 treatment combinations as :

The treatments were replicated thrice. The design was used 3x3 Factorial RBD. Under each treatment 2 Kg fruits were taken. Juice was extracted by adding equal quantity of water with fruit. The juice was further processed by addition of syrup (sugar + water + citric acid, 1:1 and 5 gm respectively), and preservative then subsequently bathing, crown

Treatment	Notation	Details of Treatment
T_1	P_0S_0	SB 0 ppm +sugar 0% +guava juice
T_2	P_0S_1	SB 0 ppm +sugar 15 % +guava juice
T_3	P_0S_2	SB 0 ppm +sugar 20%+ guava juice
T_4	P_1S_0	SB 500 ppm + sugar 0%+ guava juice
T_5	P_1S_1	SB 500 ppm +sugar 15%+ guava juice
T_6	P_1S_2	SB 500 ppm +sugar 20%+ guava juice
T_7	P_2S_0	SB 600 ppm +sugar 0%+ guava juice
T_8	P_2S_1	SB 600 ppm +sugar 15%+ guava juice
T_9	P_2S_2	SB 600 ppm +sugar 20%+ guava juice

corking, pasteurization, cooling, labeling and storage at ambient temperature was done for TSS and shelf life evaluation of processed juice. The TSS was determined with the hand refractometer and values corrected to 20 °C. For organoleptic test the colour, flavour and taste of samples were scored by a panel of minimum seven judges using nine points Hedonic scale (Amerine *et al.*, 1965). The over all rating was calculated by averaging the score. Samples obtaining a score of 5.5 and above were considered as acceptable.

RESULTS AND DISCUSSION

The TSS of guava juice as influenced by preservative and sugar levels differed significantly. The data on effect of preservative, sugar and their interaction on TSS content of juice stored at room temperature is shown in Table 1. The TSS showed increasing trend in all the treatments with increase in storage duration up to 120 days. Increase in preservative level the TSS was also found increasing in all the treatments. Higher level of sugar (20%) could not enhance the TSS% and was found significantly better with 15% sugar level in all the treatments. Without preservative and sugar very trace quality was observed in all the treatment. At 0 day of storage the maximum TSS (22.17%) was observed with T_8 followed by T_5 (22.10%) and T_2 (16.33%) treatment. Intermediate values were recorded with 20% sugar and preservatives. The lowest value (7.10%) was observed with T_1, followed by T_4 (7.33%) and T_7 (7.43%) treatment. At end of storage (120 days), the TSS was found to increase with all treatments as compared to 0 day storage but the trend was similar. The maximum TSS was recorded in T_8 (23.10%) followed by T_5 (22.97%) and T_2 (17.03%) treatment. The lowest TSS was observed in T_1 (7.33%) followed by T_4 (7.57%) and T_7 (7.67%) treatment. The increase in TSS with increase in storage duration might be due to the reduction of water percentage in juice. High percentage of preservative prevents the duration of sugar and hence maintain high TSS percentage of the juice. Higher level of sugar might have nullify the effect of preservative and cause higher rate of sugar deterioration which ultimately reduce the TSS level of the juice. Similar results were also observed by Sachin *et al.* (1969), Pruthi (1978), Augustin and Osman (1990) and Zainal *et al.* (2000).

Organoleptic quality was assessed at 120 days of juice storage. The score for texture, colour, taste, appearance and overall acceptability was found better with T_8 (7.33, 8.00, 8.00, 8.00 and 9.00 score respectively) followed by T_5 (7.00, 8.00, 7.33, 7.67 and 8.00 score respectively) and T_2 (5.00, 5.33, 6.00, 6.00 and 7.00 score respectively) treatment .The lowest values were observed with T_1 (3.00, 4.00, 3.00, 3.67 and 4.00 score respectively) followed by T_4 (4.00, 4.33, 4.00, 4.00 and 5.00 score respectively) and T_7 (4.00, 4.33, 5.00, 4.00 and 5.00 score, respectively) treatment. The preservative not only conserves TSS but also maintain organolepti

Table 1: Effect of preservative, sugar and their interaction on total soluble solid (°Brix) of guava (*Psidium guajava* L.) juice during storage at different intervals.

Preservative (Sod.Benz.) (P)	0 Day Sugar (S)			Mean (P)	30 Days Sugar (S)			Mean (P)	60 Days Sugar (S)			Mean (P)
	S_0(0%)	S_1(15%)	S_2(20%)		S_0(0%)	S_1(15%)	S_2(20%)		S_0(0%)	S_1(15%)	S_2(20%)	
P_0(0 ppm)	7.10	16.33	16.10	13.18	7.20	16.47	16.57	13.34	7.21	16.70	16.40	13.44
P_1 (500ppm)	7.33	22.10	16.37	15.27	7.37	22.23	16.97	15.39	7.47	22.43	16.90	15.60
P_2 (600 ppm)	7.43	22.17	22.10	17.23	7.5	22.57	22.17	17.41	7.57	22.77	22.30	17.54
Mean (S)	7.29	20.20	18.19	-	7.36	20.42	18.37	-	7.42	20.63	18.53	-
		F-Test	S.Ed(+)	C.D. at 5%		F-Test	S.Ed(+)	C.D. at 5%		F-Test	S.Ed(+)	C.D. at 5%
Preservative(P)		S	0.11	0.24		S	0.21	0.49		S	0.21	0.44
Sugar (S)		S	0.11	0.24		S	0.23	0.49		S	0.22	0.44
Interaction (PXS)		S	0.24	0.41		S	0.41	0.85		S	0.36	0.76

Preservative (Sod.Benz.) (P)	90 Days Sugar(S)			Mean (P)	120 Days Sugar(S)			Mean (P)
	S_0(0%)	S_1(15%)	S_2(20%)		S_0(0%)	S_1(15%)	S_2(20%)	
P_0	7.30	16.87	16.60	13.59	7.33	17.03	16.93	13.77
P_1	7.53	22.53	17.07	15.71	7.57	22.93	17.40	15.98
P_2	7.60	22.73	22.47	17.60	7.67	23.10	22.80	17.86
Mean	7.48	20.71	18.71	-	7.52	21.03	19.04	-
		F-Test	S.Ed(+)	C.D. at 5%		F-Test	S.Ed(+)	C.D. at 5%
Preservative(P)		S	0.17	0.35		S	0.20	0.43
Sugar(S)		S	0.17	0.34		S	0.20	0.43
Interaction(PXS)		S	0.29	0.69		S	0.35	0.74

Table 2: Organoleptic quality (in terms of score) of guava (*Psidium guajava* L.) juice after 120 days of storage.

Preservative (Sod.Benz.) (P)	Texture Sugar (S)			Mean (P)	Colour Sugar (S)			Mean (P)	Taste Sugar (S)			Mean (P)
	S_0 (0%)	S_1 (15%)	S_2 (20%)		S_0 (0%)	S_1 (15%)	S_2 (20%)		S_0 (0%)	S_1 (15%)	S_2 (20%)	
P_0 (0 ppm)	3.00	5.00	5.00	4.33	4.00	5.33	5.00	4.78	5.00	6.00	6.00	5.67
P_1 (300ppm)	4.00	7.00	8.00	6.33	5.00	8.00	7.00	6.67	5.00	8.00	7.00	6.67
P_2 (600 ppm)	4.00	7.33	7.00	5.67	4.33	8.00	7.00	6.44	4.00	7.33	6.00	5.78
Mean (S)	3.67	6.44	6.00	6.11	4.33	8.00	7.00	6.44	4.00	7.33	6.00	5.78
	F-Test	S.Ed(±)	C.D. at		F-	S.Ed(±)	C.D. at		F-Test	S.Ed(±)		C.D. at 5%
Preservative (P)	S	0.00	5%		Test	0.19	5%					
Sugar (S)	S	0.00	0.19		S	0.16	0.33		S	0.13		0.27
Interaction (PXS)	S	0.16	0.33		S	0.16	0.33		S	0.11		0.23
						0.27	0.57		NS	-		-

Preservative (Sod.Benz.) (P)	Appearance Sugar (S)			Mean (P)	Overall Acceptability Sugar (S)			Mean (P)
	S_0 (0%)	S_1 (15%)	S_2 (20%)		S_0 (0%)	S_1 (15%)	S_2 (20%)	
P_0 (0 ppm)	3.67	6.00	5.33	5.00	4.00	7.00	6.00	5.67
P_1 (300ppm)	4.00	7.67	7.00	6.22	5.00	8.00	7.33	6.78
P_2 (600 ppm)	4.00	8.00	7.00	6.33	5.00	9.00	7.67	7.22
Mean (S)	3.89	7.22	6.44	-	4.67	8.00	7.00	-
	F-Test	S.Ed(±)	C.D. at		F-Test	S.Ed(±)		C.D. at 5%
Preservative (P)	S	0.22	5%		S	0.11		0.27
Sugar (S)	S	0.22	0.47		S	0.11		0.27
Interaction(PXS)	S	0.38	0.47		S	0.22		0.47
			0.81					

quality intact and hence higher level of SB responded better for the parameter. Higher level of sugar could not influenced better taste and overall acceptability of the preserved guava juice. These findings are in conformity with Khurdiya and Anand (1981); Ram (1984), Singh and Singh (1994) and Pandey (1995).

REFERENCES

Augustin, M.A. and Osman, A. 1990. Post-harvest storage of guava (*Psidium guajava* L.) *Pantnka* 11(1) : 45-50.

Khurdiya, D.S. and Anand, J.C. 1981. Effect of storage, temperature on quality of Phalsa beverage. *J. fd. sci. tech.*,18 : p -16.

Pandey, A.K. 1995. Studies on guava beverage, Ph.D. Thesis, NDUAT, Faizabad (UP).

Prabhi, J.S. 1978. Processing technology of Kinnow mandarin. *Punjab Hort.* 18 : 199-202.

Ram, B.1984. Studies on processing and preservation of amla fruit beverage, M.Sc. Thesis, NDUAT, Faizabad (UP).

Sachin, B.P.; Pandey, O.P. and Shanker, G. 1969. Influence of whether on chemical composition of Guava fruit (*Psidium guajava* L.), cv. Allahabad safeda. *P.B. Hort. J.*, 9 (3 and 4) : 119-123.

Singh, P. and Singh, I.S. 1994. Physicochemical changes during storage of Litchi (*Litchi chinensis*) beverages. *Indian J. Agric. Science*. 64 (3) : 168 -170.

Zainal, B.S.; Rehman, R.A.; Ariff, A.B.; Saan, B.N. and Asbi, B.A. 2000. Effect of temperature on the physical properties of the guava juice at two different concentrations. *J. Food Eng.*, 45(1) : 55-59.

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STUDIES OF OKRA GENOTYPES TO YELLOW VEIN MOSAIC VIRUS UNDER FIELD CONDITION

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ABSTRACT

An experiment was conducted with 30 genotypes of okra to know about resistance against yellow vein mosaic virus at Indian Institute of Vegetable Research, Varanasi. Out of tested entries, VRO-6, VRO-5, Hybrid NO.-2 are found completely disease-free. In 7 genotypes, JKOH-3001, AROH-113, Ajeet-333, ZOH-808, IIVR-11 HRB-108-2 and JKOH-302 symptoms of the disease were very less during the last stage of growth. Other genotypes are found moderately resistant and susceptible while on Pusa Sawani, symptoms appeared at early stages and spread fast than other genotypes and it was tested highly susceptible.

Key words : *Okra, yellow vein mosaic, genotype.*

Okra (*Abelmoschus esculentus* (L.) *Moench*) is one of most important annual crop grown in tropical and subtropical region. Amongst the various diseases infecting this crop, yellow vein mosaic is most destructive disease of the crop and cause considerable reduction in yield and quality. If plants are infected in fifty and sixty five days after germination, suffer also of 84% and 49% (Shastry and Singh, 1974). Okra crop is very much susceptible to white fly (*Bemisia tabaci* Gen.) transmitted YVMV. The disease is characterized by vein clearing and venial chlorosis of leaves. The yellow network of vein is very conspicuous and the vein and vein lets are thickened. Fruits produced on diseased plants are often malformed, pale in colour, tough and fibrous in structure.

MATERIALS AND METHODS

The present investigation was carried out during rainy season 2006 in the field at Indian Institute of Vegetable Research, Varanasi. 30 genotypes were screened against yellow vien mosaic virus under field condition (Table 1). The experiment was laid out in randomized block design with three replications having a plot size of 3x4 meter each with a spacing of 50x30 cm^2. YVMV symptoms appeared only 54 days after sowing and continue to increase up to senescence of the crop. Number of plants affected were recorded based on vein clearing and vein chlorosis and other YVMV symptoms. The disease incidence was recorded at 15 days intervals up to the last harvesting based on scale 0=immune/free, 0.1-10.0 = resistant, 10.1-25.0=moderately resistant, 25.1-50.0 = susceptible and above 50.0= highly susceptible (Memane, *et al* , 1986). Percentage of disease incidence (PDI) was calculated using formula :

$$PDI = \frac{\text{Number of diseases plants}}{\text{Total Number of plants}} \times 100$$

RESULTS AND DISCUSSION

The reaction of the genotypes of okra against yellow vein mosaic virus incidence in presented in Table 1. 30 genotypes were screened under field condition. No chlorosis, vein clearing and mottling appeared on VRO-6, Sel.-4, VRO-5, Hybrid No.-2, these genotypes are completely free from this disease and its incidence percentage is zero and they were

Table 1 :

S.No.	Genotypes	% incidence	Reaction
1.	AROH-113	40.00	S
2.	JKOH-3001	5.76	R
3.	Ajeet-33	8.33	R
4.	Somya	11.66	MR
5.	MOBRH-913	19.51	MR
6.	VRO-6	0.0	I
7.	KS-410	11.11	MR
8.	Sel.-4	0.0	I
9.	VRO-5	0.0	I
10.	P-7	12.24	MR
11.	Pusa Sawani	71.42	HS
12.	P.Kranti	24.00	MR
13.	Larm-1	15.58	MR
14.	Sel.-10	18.75	MR
15.	HBH-412	47.61	S
16.	ZOH-808	6.69	R
17.	HBH-114	22.85	MR
18.	Hybrid No.2	0.0	I
19.	BO-13	26.16	S
20.	MBORH-311	13.33	MR
21.	HRB-108-2	5.35	R
22.	HRB-55	26.6	S
23.	Vapi	10.2	MR
24.	HRB-107-14	10.41	MR
25.	HBH-142	27.45	S
26.	Panchali	32.63	S
27.	JNDO-5	10.41	MR
28.	IIVR-11	6.25	R
29.	PM	18.33	MR
30.	JKOH-302	5.76	R

treated as immune or free to YVMV. 6 genotypes resistant to YVMV are Ajeet-333, JKOH-3001, ZOH-808, HRB-108-2, IIVR-11 and JKOH-3002 and its incidence percentage was 0.1-10.0%. These genotypes were mostly considered to be affected late in their growth phase than other genotypes. In genotypes Somya, MBORH-913, KS-410, P-7, P. Kranti, Larm-1, Sel.-10, MBORH-311, HBH-114m, Vapi,. HRB-107-14, JNDO-5, PM incidence percentage obtained was 10.1-25.0 and are treated as moderately resistant. According to observations, 5 genotypes are found to be susceptible and its incidence percentage is 25.1-50.0. These genotypes are AROH-113, HBH-142, HRB-55, HRB-142, Panchali and VO-13 (Table 1). Only one genotypes Pusa Sawani is obtained highly susceptible and the incidence percentage was 71.42. It was severely affected to YVMV and mottling, vein highly susceptible and the incidence percentage was 71.42. It was severely affected to YVMV and mottling, vein clearing, vein chlorosis appeared early in its growth phase than other genotypes and symptoms increased rapidly.

REFERENCES

Memane, V.K.; Joi, M.B. and Kale, R.N. 1986. Identification of sorace of resistance to yellow vein mosaic virus in okra cultivar. *Veg. Sci.*, 13(2) ; 324-327.

Shastry, K.S.M. and Singh, S.J. 1974. Effect of yellow vein mosaic virus infection on growth and yield of crop. *Indian Phytopathology*. (27) 316-317.

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A COMPARATIVE STUDY OF FEED ADDITIVES ON POULTRY EGG PRODUCTION : A CASE STUDY

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ABSTRACT

The present research investigation was conducted to see the efficiency of these two products in term of performance of layers. The layers were divided into 4 groups each contains 10 layers. Such as treatment I (Amnovit 75 gm + 150 kg) market layer mash, treatment II contain vimicon 375 gm + 150 kg market layer mash, treatment III is Amnovit + Vimicon (75 gm+375 gm) in 150 kg market layer mash and treatment IV control ration 150 kg market layer mash. The average egg production of the entire period in treatment 1, 2, 3 and 4 has been found as 67.79, 64.41, 68.98, 59.34% and the difference in between them in highly significant. The overall average egg weight was recorded as 52.29, 51.84, 52.12 and 50.58 gm and the difference was highly significant. Feed additives Amnovit, Vimicon or the mixture of the two have significantly increased the egg production. The results proved that the Amnovit supplement feeding has given the maximum profit.

Key words : *Feed additives, Amnovit, Vimicon.*

The nutrients required by poultry must be supplied in ration through the ingredients available in sufficient quantity. A balance ration is the one which will supply different amino acids, minerals and vitamins. These minerals and vitamins do not supply energy but they also play an important role in the regulation of several essential metabolic processes in the body. These minerals and vitamins that is critical in poultry diets. The economic returns secured from the laying flock kept primarily for the production of market eggs are affected by such factors as the average egg production per bird during the laying year amd the extent of mortality in the flock. The relative number of eggs produced in winter when egg prices are high, management efficiency, cost of inputs particularly of feed and electricity and above all the prices of eggs prevailing in the market.

MATERIALS AND METHODS

Twenty-three weeks old 40 layer were procured from the main layers stock of the poultry farm. They were divided in 4 groups, each of contains 10 layers, identical in size, body weight and

Approximate proximate analytical specification of market layer mash

S.No.	Constituents	Parts (%)
1.	Crude protein (minimum)	19
2.	Fat (minimum)	4
3.	M.E. (minimum)	2700 K Cal.
4.	Fibre (maximum)	6
5.	Sand/Silica (maximum)	3

second week. The result clearly shows that the egg production has been higher in T-III group and minimum in T-IV group.

The difference in the percentage egg production in between the four treatments in highly significant as it is clear from the ANOVA Table 2 on the basic of % C.D. value (3.84) the difference between I , II and III is not significant.

The average weekly egg weight in treatment I (Amnovit), treatment II (Vimicon), treatment III (Amnovit+Vimicon) and treatment IV (Control) groups have been recorded as 52.29, 51.84, 52.13 and 50.59 gm respectively (Table 3). The egg weight

Table 2 : Average egg production percentage

Weeks	Treat.-I	Treat.-II	Treat.-III	Treat.-IV	Total	Mean
1.	57.71	54.28	55.71	58.57	224.27	56.06
2.	77.14	65.71	75.71	67.14	285.70	71.42
3.	67.14	68.57	74.28	65.71	275.70	68.92
4.	68.57	60.00	64.28	61.42	254.27	63.56
5.	67.14	61.42	71.42	55.71	255.69	63.92
6.	71.42	72.85	71.42	50.00	265.69	66.42
7.	74.28	68.57	68.57	64.28	275.70	68.92
8.	70.00	67.14	64.28	60.00	271.42	67.85
9.	68.57	71.42	74.28	58.57	272.84	68.21
10.	60.00	64.28	64.57	57.14	245.99	61.49
11.	65.71	54.28	64.28	54.28	238.55	59.63
Total	745.68	708.52	758.08	652.82	2865.82	
Mean	67.79	64.41	68.98	59.34		65.10
±	1.81	1.899	1.860	1.54		1.397
S.D.	6.005	6.307	6.175	5.125		4.638
CV%	8.86	9.79	8.95	8.64		7.12

Egg production (%) in four treatments

Source	D.F	S.S	M.S	F Value	F Table	
					5%	1%
Replication (Birds)	10	865.61	96.18	5.38**	2.09	2.84
Treatment	3	614.51	204.84	11.45**	2.92	4.51
Error	30	536.73	14.89			

C.D.= 3.84 do not differ significantly.

Table 3 : Average egg weight (g.)

Weeks	Treatment I	Treatment II	Treatment III	Treatment IV	Total	Mean
1.	48.75	49.12	49.07	47.64	194.58	48.64
2.	50.04	51.18	52.12	53.13	206.47	51.61
3.	51.43	49.44	43.31	48.34	198.52	49.63
4.	48.87	51.79	51.44	44.04	196.14	49.03
5.	54.04	50.59	51.51	48.04	204.18	51.04
6.	51.63	51.81	51.51	52.52	207.47	61.86
7.	52.45	50.46	52.41	51.56	206.88	51.72
8.	51.17	53.03	51.54	51.94	207.68	51.92
9.	53.45	52.85	53.60	54.57	214.41	53.60
10.	55.12	53.10	54.84	46.88	209.94	52.48
11.	58.24	56.94	56.04	57.85	229.07	57.26
Total	575.19	570.31	573.39	558.45	2275.34	

Mean	52.29	51.85	52.13	50.99	51.71
SE	0.85	0.65	0.63	1.12	0.72
S.D.	2.82	2.17	2.09	3.98	2.38
CV%	5.39	4.19	4.01	7.87	4.59

Egg production weight in four treatments

Source	D.F	S.S	M.S	F Value	F Table	
					5%	1%
Replication	10	255.86	22.58	6.62**	2.09	2.84
Treatment	3	19.70	5.56	1.92	2.92	4.51
Error	30	102.53	3.41			

S.E = 0.83

C.D. = 3.84 do not differ significantly

recorded in each week indicate the minimum egg weight 48.75, 49.12, 49.07 and 47.64 gm and the maximum egg weight (last week) as 58.24, 56.94, 56.04 and 57.85g in respective 4 treatments. The overall average egg weights of the four treatments have ranged from minimum of 49.03 to the maximum of 57.26 gm.

The difference in the egg weight means in between the four treatments is significant (ANOVA Table 3) but minimum egg weight has been recorded (50.59 g) in control and maximum in Amnovit group (52.29 g). The egg weight in each treatment has showed considerable increasing trend with the passage of time. The similar results were also reported by Ozpinar *et al.* (1986), Koci *et al.* (1988) and Bougon *et al.* (1989).

REFERENCE

Bougon, M.M.; Menec, M.L.F. and Launay, M. 1989. Study of availability of amino acid in the laying hen. *Bulletin d. information. Station experimental. d. Aviculture de ploufragem, France.* 29(i) : 3-7

Koci, S.; Kociova, Z. and Gergelyolova, V. 1988. Supplementary DL- methionine and L-Lysine in feedmixtures low in crude protein for layers 23, 29-35

Ozpinar, A.; Ozpinar, H. and Asig, T. 1986. Effect of different amounts of calcium an egg production feed intake and egg weight. 12 (2): 40-50 (Jr. En, 23 ref). *Instanbul University Veterinar fakilteri Biyokimya Bilim Dali Selimiye Istanbul Turkey*

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EFFECT OF ROOT CUT, SHOOT CUT AND THEIR INTERACTION ON SEED YIELD OF RADISH (*RAPHANUS SATIVUS*, L.) CV. PUSA RESHMI AS A SEED CROP

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ABSTRACT

Four root cuts and three shoot cuts as well as their interactions were studies. The results revealed that the seed yield per plant gave positive relation only with the slight root cut (R1) in radish seed production 19.83 gm per plant. The interaction (R1S0) means ¼ root cut and no shoot cut gaves better performance in seed yield (25.0 gm./plant) as compare to control, but other extents of root and shoot cuts reduced the seed yield/plant.

Key words: *Effect, radish, root cut, shoot cut*

Vegetables constitute an important item of human diet. Among the vegetables, the performance of a root crop entirely depends on the quality of seed because majority of the root crops are directly sown crops. The seed production of root crops is a highly technical job and hence it is not done by majority of growers. Being a very vast country, to meet out the demand for quality seed in becoming day-by-day great problem for the government and private agencies.

Radish (*Raphanus sativus*, L.) is a popular and important root vegetable belongs to the family Cruciferae and is a quiet growing herbaceous annual. The Asiatic varieties, which are for tropical climate, produce edible root in first season and seed in the second season. Attempts have been made to improve upon the existing Asian varieties and crosses were also made between Asian and exotics to obtained new varieties with root quality of exotic types and their ability to produce seed in the plains (Singh *et al*., 1971; Sinha, 1980).

Mainly two methods are use for seed production in radish *i.e.* sticking to seed method or transplanting method and seed to seed method or *in situ* method. Generally, sticking to seed method has been found time and again more authentic and perfect as far as quality of seed in concerned. The aforesaid method, a considerable amount of edible root has to be wasted for getting quality seed. Hence it was felt necessity to fulfill the growing demand of quality seed in this popular root crop, particularly in Allahabad region which has a great potential for edible fleshy root as well as seed production quality.

MATERIALS AND METHODS

The present study was carried out in the year 2003-04 at farmer's field in the supervision of Diversified Agricultural Support Project (DASP)-RDSKVK (NGO), Allahabad . Four root cuts and three shoot cuts as well as their interactions had been initiated in the present studies. The four root cut and control (no root cut), ¼ root cut, ½ root cut and ¾ root cut and three shoot cuts and control (no shoot cut, ½ shot cut and ¾ shoot cuts). There were 12 treatment combinations, which are replicated 3 times. The design use for the experiment was a randomized block design.

RESULTS AND DISCUSSION

The summary table of effect of root cuts on seed yield per plant showed that the maximum seed yield per plant (19.83 gm) were recorded with R_1 (1/4 root cut) and minimum (14.24 gm) with R_3 (3/4 root cut). The seed yield per plant gave positive relation only with the slight root cut in radish seed production.

Table 1 : Effect of root cuts on seed yield per plants

Root cut	Seed yield per plant (gm)	Deviation from control
R_0	19.44	-
R_1	19.83	+0.39
R_2	15.94	-3.50
R_3	14.24	-5.20
F test (5%)	S	
C.D. (5%)	0.604	

A similar trend was also noticed with the shoot cut. Here S_0 and S_1 recorded maximum seed per plant (19.21) with the control (no cut) followed (Table 2).

Regarding the interaction between the root cut and shoot cut on the seed yield per plant R_1S_0 recorded the maximum seed yield (25.0) as against control (22.0). But other extents of root cuts reduces the seed yield per plant as in R_1S_1 (21.5) etc. From the above said findings, it is clear that ½ and ¼ root cut have affected the plants growth, flowering and yielding capacity adversely, where as ¼ root cut has given better performance in seed yield per plant and yielding capacity per hectare as compare to control as was reported by (Koyama *et al.*, 1968). Chakrabarti *et al.* (1979) found that trimming of the top levels without injuring the crown gave better result under Allahabad condition. Kalvi and Nath (1970) reported highest yield of 7.4 Qt per hectare was obtained with plants of 2/3 shoot and ½ root cut due to early vegetative growth and early seed stalk emergence.

Table 2: Effect of shoot cuts on seed yield per plant

Shoot cut	Seed yield per plant (gm)	Deviation from control
S_0	19.21	-
S_1	17.99	-1.22
S_2	14.89	-4.32
F test (5%)	S	
C.D. (5%)	0.612	

Table 3 : Effect of interaction on seed yield per plant

Shoot cut/Root cut	S0	S1	S2	Mean
R_0	22.0	20.16	16.16	19.44
R_1	25.0	21.50	13.00	19.83
R_2	13.5	18.33	16.00	15.94
R_3	16.35	11.99	14.34	14.24
Mean	19.21	17.99	14.89	
C.D. (5%)	0.549			

REFERENCES

Chakrabarti, A.K., Sinha, S.N. and Singh, D. 1979. Studies with radish for seed production using various N fertilizer and trimming levels and spacing. *J. of Hort.*, 49 (2555) : 223.

Kalvi, S. and Nath, P. 1970. Seed production of root crops, Vegetables for topical region (Ed.) Premanth : 55-56.

Koyama, T.; Nakamura, H. and Yemoda, E. 1968. Studies on growing Japanese white radish seed, *Bull. Hort. Res.* Station, Horatsuka, No. 7 : 37-83.

Sinha, R.K. 1980. Efficiency of the extent of root and shoot cut on the growth and yielding capacity of radish as a seed crop Cv. Japanese white. M.Sc. (Ag.) Thesis, Allahabad Agricultural Institute, Allahabad, U.P.

Singh, K.; Singh, A.K. and Lal, G. 1971. Effect of spacing and methods of seed production on seed yield in radish, *South India Hort.* 33(3) :206-208.

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EVALUATION OF DIFFERENT OKRA [*ABELMOSCHUS ESCULENTUS* (L.) MOENCH] CULTIVARS AGAINST RED COTTON BUG, AND FRUIT AND SHOOT BORER UNDER FIELD CONDITION

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ABSTRACT

Studies on the seasonal incidence of major pests *viz.* red cotton bug (*Dytdercus signulatus* Fabr.), and fruit and shoot bores (*Earias uittella* Fabr) on different cultivars of okra showed that the pests appeared on the 4th week of February. The incidence of red cotton appeared on the 4th week of April and gradually increased and reached peak level during 2nd week of May. The incidence of fruit and shoot borer appeared on 1st week of April and gradually increased and reached peak level during 2nd week of April.

Key words : *Abelmoschus esculentus, Dytdercus signulatus, Earias uittella.*

Agriculture is the stepping stone for development of any country. During last three and half decades, there has been more than a two flow increases in food grain production. This is largely due to the introduction of high yielding crop varieties, fertilizer, irrigation and improved agronomic practices. In India, about 20% of the crop yield loss is due to insect pests. India has second rank in the world in vegetable production and about 2.8% of total cropped area is under vegetable production where as China stands first rank in vegetable production world wide Annual losses due to the insect pest is estimated to billions of dollars. In India, 10-30% losses are common, but in case of outbreaks, losses increased up to 50-90% (Singh *et al*., 2002). Okra is an annual vegetable crop grown in tropical and subtropical region. Okra, Bhindi, lady's-finger belong to the family Malvaceae genus *Abelmoschus* and species *esculentus*.

There are many insect pests which attack on okra crop. Among these insect pests, fruit and shoot borer, red cotton bug, jassids and white fly are found to attack the crop commonly in Allahabad agroclimatic condition. Red cotton-bug *Dytdercus signulatus* Fab. (Pyrrhocoridae, Hemiptera). Nymph and adults suck the green bolls resulting in erratic boll opening and poor lint quality (Ghosh *et al*., 1999). A bacterium *Nematosporu gossypi* enters the site of injury. Seed become unfit for sowing okra; cotton and silk cotton are the alternative hosts.

Fruit and shoot bore *Earias vittella fabricus* and *E. insulanc, Boisd.* belong to Family Noctuidaceae. The larvae bores into tender terminal shoots in the vegetative stage and flower buds, flower and young fruit in the fruit formation stage (Raj *et al*., 1993). The damaged shoot drop, wither and dry up. The infested fruits present a deformed appearance and become unsuitable for consumption. The bored holes present on the fruit are seen phigged with excreta. Jassid *Amrosca biguttula biguttula* Ishida (Cicadellidue-Hemiptera) both nymphs and adults occur in large number on the young plants and desap them mostly by continuing themselves on the under surface of the leaves (Devasthali and Sharan, 1997). The attacked leaves may show the so called "Hopper burn" symptom.

MATERIALS AND METHODS

The present study was conducted in the Department of Plant Protection Allahabad Agricultural

institute-Deemed University, Allahabad Uttar Pradesh, India.

Varities used: Arka, Abhay, Parvani and Kranti. All the agronomic practices required for okra crop was done.

Seasonal incidence of important insect pests on different cultivars of okra: The seasonal incidence of different cultivars of okra, the experiment was conducted during the entire crop growth period of unprotected okra plants.

Seasonal incidence of red cotton bug: observation on red cotton bug incidence was carried out simultaneously on fifteen randomly selected okra plants from each cultivars.

Seasonal incidence of fruit and shoot borer:- observation on *E. vitella* incidence was recorded on five randomly selected okra plant from each cultivars (*Zala et al.*, 1999). The numbers of *E. vitella* were counted from the percentage of fruit damaged by fruit and shoot borer. The observations were recorded weekly.

Metrological data: the data on maximum and minimum temperature, selective humidity, sunshine hours, rainfall and wind velocity were collected from the University Metrological Observatory located close to the experimental site. The data were correlated with the population of insect pests.

Assessment of yield loss due to the insect: Two Varieties *viz.* Arka Abhay and Parvani Kranti were evaluated for their yield as influenced by the insect for total marketable yield. Including insect infected fruit were recorded. The growth and yield parameters were estimated following the method of yield attributes such as number of fruits/ plant, yield of fruits/plant, yield of fruits/ plot and yield of fruit in quintal / hectare were recorded. Yield loss was recorded by weighing the infested fruit out of the total fruits.

$$\text{Yield (q/ha)} = \frac{\text{Yield (gm/m}^2\text{)}}{10}$$

RESULTS AND DISCUSSION

Seasonal incidence of important insect pests on different cultivar of okra, have been summerized in Table 1.

Seasonal incidence of red cotton bug: The incidence of red cotton bug, *Dysdercus signulatus* on okra during 2006 commenced from 71 days after sowing

Table 1: Incidence of differnet insect pest of Bhindi [*Abelmoschus esculents* (L.) Moench] on different cultivars in zaid season 2006

Variety	AVERAGE POPULATION	
	Red cotton bug/leaf	Fruit and shoot borer/plant
Arka Abhay (V1)	0.063	0.096
Parvani Kranti (V2)	0.066	0.113
LORM-1(V3)	0.060	0.086
VRO-5 (V4)	0.070	0.113
VRO-6 (V5)	0.073	0.143
Hissar Unnat (V6)	0.086	0.186
Varsha Uphar (V7)	0.146	0.216
D-1-87-5 (V8)	0.060	0.083
Pusa Makhamali (V9)	0.076	0.166
Punjab-7 (V10)	0.040	0.053
Prabhani Kranti (check	0.063	0.086
F. test	S	S
S.E. (±) C.D. at 5%.	0.022	0.046
	0.046	0.095

i.e. 4th week of April (17th standard week). The average population level of red cotton-bugs per leaf area on different cultivars of okra.

Average population of red cotton bug per leaf: The data show incidence of red cotton bug are 0.04 per leaf in Punjab-7, and 0.06 per leaf in D-1-87-5 and LORM-1 which is less than 0.063. per leaf Prabhani Kranti (check Prabhani Kranti, the local variety of Bhindi used by maximum farmers in Allahabad Agroclimatic condition. Except above, all vesities are more infested by red cotton bug in comparison the Prabhani Kranti (check). The infestation of red cotton-bug is maximum 0.146 in Varsha Uphar. The infestation in decreasing order is as: V7> V6> V9> V5> V4> V2> V1=V11>V3=V8>V10.

Second incidence of fruit and shoot borer: the incidence of *Earias vittela* on okra during 2006 commenced from 50 days after sowing *i.e.* 1st week of April (14th standard week). The average population level of fruit and shoot borer per plant on different cultivars of okra are as : The incidence of fruit and shoot borer are 0.053 per plant in Punjab and 0.083 per plant in D-1-87-5 which is less than 0.086; per plant in Prabhani Kranti (check). Incidence in LORM-1 is equal to prabhani kranti. Except above, all varieties were more infested fruit and shoot borer in comparison the Prabhani Kranti (check). The infestation of fruit and shoot bore is maximum 0.216 in Varsha Uphar. The infestation (in decreasing order) are following V7> V6> V9> V5> V4> V2> V1> V11> V3> V8> V10.

REFERENCE

Devasthali, S. and Saran, R. 1997. Studies on pest complex of lady's finger (bhindi) during kharif season in malwa region of Madhya Pradesh. *Crop Research (Hissar)*, 13: 429-435.

Ghosh, J.; Gosh, S.K.; Chtterjee, H. and Sanapati, S.K. 1999. Pest constraints of okra under tarai region of west Bangal. *Indian J. of Entomol.*, 61: 362-371.

Raj, H.; Bhardwaj, N.L.; Sharma, I.M. and Sharma, N.K. (1993). Performance of commercial okra varieties in relation to disease and insect pests. *Indian journal of agriculture science*., 63 (II): 747-748.

Singh, S. S.; Gupta, P. and Gupta, A.K. 2002. *Hand book of Agricultural Sciences*. Kalyani Publishers, Ludhiana, pp. 304-367

Zala, S.P.; Patel, J.R. and Patel, N.C. 1999. Impact of weather and magnitude of *Earias vitalla* infesting okra. *Indian J. of Entomol.*, 61: 351-355.

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EFFECT OF NITROGEN AND BIOFERTILIZERS ON PLANT VIGOUR AND BULB YIELD OF GARLIC (*ALLIUM SATIVUM* L.) CV G-282

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ABSTRACT

Data indicated the standardize suitable combinations of nitrogen and biofertilizer for better vigour and yield of garlic. There was a synergistic effect of bioferlizers recorded with nitrogen on plant height of the garlic. All the biofertilizer treatments were found better over untreated one. The increased vigour was recorded when both the biofertilizers were applied with 100% dose of N fertilizer. Maximum height was recorded (69.67cm) in T_3 treatment (with full dose of N +Azo+PSB), while the lowest value (57.80 cm)was observed in T_0 treatment (45%N+N0 biofertilizer). Similar results were also obtained in yield parameter and the maximum yield (21.86/ha.) was observed in T_3 treatment and the minimum yield (14.85 t/ha.) was found in T_0 treatment. It may be concluded that T_3 treatment can be recommended for better plant vigour and bulb yield of garlic.

Key words : *Garlic, biofertilizer, vigour, bulb yield.*

Garlic (*Allium sativum* L.), the second most widely cultivated bulbs crop after onion, has long been recognized as valuable spice and condiment through out the India. It is frost hardy, bulbous, erract annual herb of 30-100 cm in height with narrow flat leaves and bears small white flowers and bulbils or segment called cloves which are formed auxiliary buds of the young foliage leaves. It is of diverse in use as flavoring agent, spices and condiments, chutneys, pickles, curry powders, curried vegetables, ketchup, medicines, antimicrobial, nematicidal, insecticidal, mosquito repellent, nutritional (protein-6.3%, minerals 1%, CHO-29% and vitamins A175 IU) etc.

Low productivity and poor quality is the limitation of its cultivation in India. Among the environmental factors, the nutrition is the utmost important to tap genetical potential of the crop. Nitrogen being structural and functional part of the plant required major attention in supplication. Biofertilizers gaining popularities by several additive factors as yield, quality, sustainability, soil health, low cost input, eco-friendly and so on in agriculture. Keeping these aspects in view, the experiment was undertaken to standardize suitable nitrogen with biofertilizers level to obtain better plant vigour and bulb yield of garlic.

MATERIALS AND METHODS

The experiment was conducted with different levels of N and biofertilizers on plant height and bulb yield of garlic at Research Farm, Department of Horticulture, K.A.P.G. College, Allahabad (UP). There were 12 treatment combinations *i.e.*

Recommended dose of fertilizer was given as 120, 80, 60 Kg. , N, P, K +25 tonne FYM per hector, respectively.

Design was used 3x4 factorial RBD with three levels (F_1 , F_2 and F_3 as 100, 60 and 45 % N of recommended dose) of nitrogen and 4 levels (B_0, B_1, B_2 and B_3 as 0, PSB, *Azospirillum* and *Azospirillum*+PSB respectively) of biofertilizers. The treatments were replicated thrice. Total no. of plots were 36 with a unit plot size of 1.5 x 1m. Full dose of P, K & FYM with one 1/3 rd N was applied as basal dose before planting. The remaining N was spread at the rate of 1.5% at 25 and 40 days age of crop in

Treatment	Notation	Combination Details
T_1	F_1B_0	100% N recommended dose of fertilizers +Full P, K& FYM
T_2	F_1B_1	100%N +full P, K &FYM+Azospirillum
T_3	F_1B_2	100%N +full P, K &FYM+ PSB
T_4	F_1B_3	100%N +full P, K &FYM+ Azospirillum +PSB
T_5	F_2B_0	60% N +Full P, K & FYM
T_6	F_2B_1	60% N +Full P, K & FYM +Azospirillum
T_7	F_2B_2	60% N +Full P, K & FYM +PSB
T_8	F_2B_3	60% N +Full P, K & FYM +Azospirillum +PSB
T_9	F_3B_0	45% N +Full P, K &FYM
T_{10}	F_3B_1	45% N +Full P, K &FYM + Azospirillum
T_{11}	F_3B_2	45% N +Full P, K &FYM +PSB
T_{12}	F_3B_3	45% N +Full P, K &FYM+Azospirillum +PSB

equal quantity. To supply these nutrients urea, SSP and MOP were used. The biofertilizer *i.e. Azospirillum* and PSB were used as seed and soil treatment. Both the bio agents were used @ 250 gm per 100 kg of cloves treatment and for soil treatment @ 5 kg per hector were used as a basal dose before planting. The soil was sandy loam in texture and all operation were done as per rules.

Plant height was measured in cm from the base of the plant up to the highest level reached by the leaves in natural condition and later on averaged. Five plants were randomly selected from each plot. Height was measured after 20 days of planting and continue up to maximum growth stage keeping 20 days interval between the measurement. Bulb yield was recorded by taken weight of each plot yield and averaged.

RESULTS AND DISCUSSION

Plant vigour & yield was significantly influenced by the application of nitrogen & biofertilizers. The data on plant height of garlic given in Table 1 indicates that the effect of levels of nitrogen, biofertilizers and their interaction was non significant upto 20 days after planting however at 40, 60, 80, 100 and 120 days after planting significant effect was observed. It is also clear from the table that plant height increase continuously upto 100 days after planting and there after no growth was recorded. At 100 days after planting, the treatment T_2 showed maximum vigour (69.67 cm) followed by T_4 (65.46 cm) and T_6 (63.46 cm). The minimum values were recorded with T_1 (57.80 cm) followed by T_5 (61.60 cm) and T_3 (61.67cm) treatment. The effect of biofertilizer was significantly greater over without biofertilizer applied treatments. Both the fertilizers when applied together respond better when applied separately in individual. Similar results were also observed by Pandey and Kumar (1989), Mishra *et al.*, (1991), Govetdarajan *et al.*, (1993), Varade *et al.*, (1995) and Naidu *et al.*, (2000).

Similar result (Table 2) was also observed with yield parameter and maximum bulb yield was observed T_2 (21.86 tonne/hec) followed by T_4 (20.67 tonne/hec) and T_6 (19.46 tonne/hec). The lowest yield was recorded with T_1 (14.84 tonne/hec) followed by T_5 (17.13 tonne/hec) and T_3 (17.99 tonne/hec) treatment. The values of other treatment were intermediate in order as level of nitrogen and biofertilizers were increased. These results are in conformity with the finding reported by Wange (1995), Thilakavathy and Ramaswamy (1998), Yadav *et al.*, (2005) and Mahanthesh *et al.*, (2005).

Nitrogen being structural and functional part of the plant need in huge quantity for proper growth and development of the vegetative as well as reproductive part of plant. Level of nitrogen were increased upto recommended level hence, the effect

Table 1: Effect of different levels of nitrogen and biofertilizers on height of the garlic plant

20 DAP

Nitrogen (F)	Biofertiliser (B)				Mean (F)
	B_0	B_1	B_2	B_3	
F1(100%RDN)	20.30	21.53	22.97	24.13	22.55
F2(60%RDN)	20.27	21.03	21.43	23.47	21.32
F3(45%RDN)	19.87	20.53	20.63	21.00	20.51
Mean(B)	20.13	21.38	21.68	22.90	
		F-Test	S.Ed(±)	C.D at 5%	
Nitrogen(F)		NS	-	-	
Biofertiliser(B)		NS	-	-	
Interaction(FxB)		NS	-	-	

40 DAP

Nitrogen (F)	Biofertiliser (B)				Mean (F)
	B_0	B_1	B_2	B_3	
F1(100%RDN)	27.27	29.56	30.56	30.83	29.81
F2(60%RDN)	26.83	28.80	28.76	29.30	28.17
F3(45%RDN)	26.16	27.87	28.28	28.53	27.74
Mean(B)	26.82	28.74	29.17	29.55	
		F-Test	S.Ed(±)	C.D at 5%	
Nitrogen(F)		S	0.07	0.19	
Biofertiliser(B)		S	0.08	0.17	
Interaction(FxB)		S	0.14	0.29	

60 DAP

Nitrogen (F)	Biofertiliser (B)				Mean (F)
	B_0	B_1	B_2	B_3	
F1(100%RDN)	57.27	61.33	63.20	65.60	61.85
F2(60%RDN)	57.07	59.26	60.53	60.87	59.43
F3(45%RDN)	53.93	57.80	58.00	58.28	57.00
Mean(B)	56.09	59.46	60.58	61.58	
		F-Test	S.Ed(±)	C.D at 5%	
Nitrogen(F)		S	0.15	0.38	
Biofertiliser(B)		S	0.17	0.35	
Interaction(FxB)		S	0.29	0.60	

80 DAP

Nitrogen (F)	Biofertiliser (B)				Mean (F)
	B_0	B_1	B_2	B_3	
F1(100%RDN)	48.36	52.83	54.33	54.43	52.47
F2(60%RDN)	48.90	50.73	51.13	51.80	50.42
F3(45%RDN)	47.80	49.93	50.20	50.20	49.53
Mean(B)	48.02	51.16	51.89	52.14	
		F-Test	S.Ed(±)	C.D at 5%	
Nitrogen(F)		S	0.12	0.26	
Biofertiliser(B)		S	0.14	0.30	
Interaction(FxB)		S	0.25	0.52	

100 DAP

Nitrogen (F)	Biofertiliser (B)				Mean (F)
	B_0	B_1	B_2	B_3	
F1(100%RDN)	61.67	68.60	69.53	69.67	67.37
F2(60%RDN)	61.60	63.73	65.13	65.46	63.98
F3(45%RDN)	57.80	62.80	63.42	63.46	61.87
Mean(B)	60.36	65.04	66.03	66.20	
		F-Test	S.Ed(±)	C.D at 5%	
Nitrogen(F)		S	0.16	0.35	
Biofertiliser(B)		S	0.18	0.38	
Interaction(FxB)		S	0.32	0.66	

120 DAP

Nitrogen (F)	Biofertiliser (B)				Mean (F)
	B_0	B_1	B_2	B_3	
F1(100%RDN)	61.67	68.60	69.53	69.67	67.37
F2(60%RDN)	61.60	63.73	65.13	65.46	63.98
F3(45%RDN)	57.80	62.80	63.42	63.46	61.87
Mean(B)	60.36	65.04	66.03	66.20	
		F-Test	S.Ed(±)	C.D at 5%	
Nitrogen(F)		S	0.16	0.35	
Biofertiliser(B)		S	0.18	0.38	
Interaction(FxB)		S	0.32	0.66	

Table 2: Effect of different levels of Nitrogen & Biofertilizers on bulb yield of Garlic

Nitrogen (F)	Biofertilizer (B)				Mean(F)
	B0	B1	B2	B3	
F1(100%RDN)	17.99	20.85	21.75	21.86	20.62
F2(60%RDN)	17.13	19.70	20.51	20.67	19.50
F3(45%RDN)	14.85	18.45	18.73	19.46	17.88
Mean(B)	16.66	19.67	20.33	20.66	
		F-Test	S.Ed(±)	C.D at 5%	
Nitrogen(F)		S	0.047	0.098	
Biofertilizer(B)		S	0.054	0.113	
Interaction(FxB)		S	0.094	0.195	

was found ascending in nature for the vigour and the yield of the plant. Biofertilizer not only provides suitable micro-environment to rhizosphere but also mineralizes nutrients present in unavailable form in the soil. Hence, increased availability of macro and micro-nutrients was realized. *Azospirillum* fixes the free nitrogen of atmosphere hence, increases the level of nutrients to the soil. PSB makes phosphorous in available form. Synergistic effect of nitrogen and biofertilizer proved significantly better for the vigour and yield of the plant.

REFRENCES

Govindarica, N.; Molonevic, N. and Jarok, M. 1994. Efficient application of associative nitrogen fixing bacteria in vegetable production. *Savremena Poljoprjareda*, Yugoslavia, 42(1): 303-308.

Mahentesh, B.; Venkatesha, J.; Thippesha, D.; Poornima, G. and Umesh, K. 2005. Effect of bio-fertilizers with level of NPK on growth and yield of onion (*Allium cepa* L.) cv. Bellary Red grown under irrigated condition in central dry zone of Karnataka, *Karnataka J. Hort.* 1(3):70-75.

Mishra, M.M.; Kapoor, K.K.; Chander, K. and Laura, R.D. 1991. Sustainable agriculture, the role of integrated nutrient management, *A Review, Department of Microbiology*, C.S. Haryana. Agric.Univ. Hissar, 9(3):153-171.

Naidu, A.K.; Tiwari, J.P.; Diwedi, S.K. and Saxena, S.K. 2000. Effect of various levels of NPK on physiological growth determinants of productivity in garlic (*Allium sativum* L.) Veg. Sci., 27(2):165-167.

Pandey, A. and Kumar, S. 1989. Potential of *Azotobacter* and *Azospirillum* as biofertilizers for upland agriculture, *J. Sci. Indian Res.* 48(3):134-144.

Thilakvathy, S. and Ramaswamy, N. 1998. Effect of organic & biofertilizers treatments on yield & quality parameters of multiplier onion (*Allium cepa* L.) *National Hort. Res. and Dev.* 18(2):18-20.

Wange, S.S. 1996. Effect of biofertilizers under graded nitrogen level on carrot (*Daucus carota* L.) *Ann. Pl. Phy.*,10(1):96-98.

Warade, S.D.; Desale, S.B. and Shinde, K.B. 1995. Effect of organic, inorganic and bio-fertilizers on yield of onion bulbs cv. B-780. *J. Maharashtra, Agric. Univ.*, 20(3): 467-468.

Yadav, B. D.; Khandelwal, R.B. and Sharma, Y.K. 2005. Use of biofertilizer (*Azospirillum*) in onion, *Indian. J. Hort.*, 62(2):168-170

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EFFECT OF HERBICIDES ON WEED FLORA AND GRAIN YIELD IN WINTER MAIZE *(ZEA MAYS L.)*

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ABSTRACT

A field experiment was conducted during the Rabi season of 2003-2004 to evaluate the effect of different herbicides to control weeds in winter maize (*Zea mays*). Atrazine at 2.0 kg/ha and Alachlor at 1.5 kg/ha were applied as pre-emergence herbicides while 2,4-D at 0.500 kg/ha was applied as post-emergence at 30 days after sowing. Weed dry weight and weed population remained significantly with all the treatments compared to un-weeded plots. Pre-emergence application of Atrazine followed by wheel Hoeing at 30 days after sowing (DAS) resulted in significantly lowered weed population and weed dry weight. Highest grain yield was obtained in the un-weeded plots. Pre-emergence application of Atrazine at 2.0 kg/ha was at par with pre-emergence application of Atrazine followed by post emergence of 2,4-D at 0.500 kg/ha at 30 days after sowing (DAS).

Key Words: *Effect, Winter Maize, weed*

Maize is one of the most important cereal crops in many parts of the world occupying an area of 120.54 million ha. Maize is said to be the queen of cereals in solving the food production of feed problem of poultry, piggery and other livestock. Maize is grown in rainy as well as in winter season. The crop has to grow in an environment very conductive for weed infestation. The extent of losses caused by weeds depends upon density and nature of crop, density of weeds, the weed species and fertility status of soil. The growth rate of maize in its early stage in rather slow which helps weeds to offer effective competition. The extent of losses due to infestation of weeds in maize crop has been fund to be 29 to 74% (Mani *et al*., 1968).

MATERIALS AND METHODS

A field experimental was conducted during the Rabi Season of 2003-04 at Crop Research Farm, Department of Agronomy, Allahabad Agricultural Institute-Deemed University, Allahabad.

The soil of the experimental field was sandy loam in texture with pH 7.5. Eleven treatments comprised viz. weed check, weed free, mechanical weeding at 15 days after sowing, pre-emergence application of Alachlor at 1.5 kg/ha, pre-emergence application of Atrazine at 2.0 kg/ha, post-emergence application of 2,4-D at 0.500 kg/ha at 30 days after sowing, mechanical weeding at 25 days after sowing, pre-emergence application of Alachlor and mechanical weeding at 30 days after sowing, pre-emergence application of Atrazine and mechanical weeding at 30 days after sowing, pre-mergence application of Alachlor and post-emergence application of 2,4-D at 30 days after sowing, pre-emergence application of Atrazine and post-emergence application of 2,4-D at 30 days after sowing were tested in Randomized Block Design (RBD) with three replications. Maize variety "Nutan KH-101" was sown at 60x25 cm

spacing during the second week of October. Crop was fertilized at 160 kg N, 60 kg P_2O_5 and 80 kg K_2O per hectare. Full dose of P_2O_5 and K_2O and half dose of nitrogen was applied at the time of sowing and remaining half dose as top dressed in two equal splits at 30 and 60 days after sowing. Weeds were collected from an area of 0.25 m^2. Weed dry weight was recorded and weed control efficiency (WCE) was calculated by the formula.

$$WCE = \frac{WC-WT}{WT} \times 100$$

where,

WC = Dry weight of weed of control plots.

WT= Dry weight of weeds of treated plots.

RESULTS AND DISCUSSION

The dominant weeds of the experimental field were *Cyperus rotundas, Cynodon dactylon, Chenopodium album, Anagallis arvensis, Melilotus* spp., *Digitaria sanguinallis, Sorghum halepense, Parthenium hysterophorus* etc which constituted the total weed flora. All herbicide treatments significantly reduced the dry matter accumulation of weed compared with the unweeded plots. Pre-emergence application on Atrazine followed by mechanical weeding at 30 days after sowing resulted in significantly lower weed population and weed dry weight as compared to unwedded plots. This was followed by pre-emergence application of Atrazine followed by post-emergence application of 2,4-D at 30 days after sowing.

Higher weed control efficiency were recorded in pre-emergence application of Atrazine followed by mechanical weeding at 30 days after sowing. Next in the sequence is pre-emergence application of Atrazine followed by post-emergence application of 2,4-D at 30 days after sowing. Lower seed index was recorded in Atrazine followed by mechanical weeding at 30 days after sowing which was at par with pre-emergence application of Atrazine followed by post-emergence application of 2,4-D at 30 days after sowing (Table 1).

The highest plant height, number of leaves, number of grain per row per cob, grain per cob as well as grain row per cob was recorded in weed-free plots which was followed by pre-emergence application of Atrazine followed by post-emergence application of Atrazine followed by post-emergence application of 2,4-D at 30 days after sowing (Table 1).

The highest plant height, number of leaves, number of grain per row per cob, grain per cob as well as grain row per cob was recorded in weed-free plots, which was followed by pre-emergence application of Alachlor and pre-emergence application of Atrzaine. Cob weight, test weight and other yield attributes were highest in weed-free plot. Among the herbicides, pre-emergences application of Atrazine followed by mechanical weeding at 30 days after sowing gave highest cob weight, test weight and other yield attributes Grain yield, stover yield was higher in weed-free plots, which was at par with pre-emergence application of Atrazine. Pre-emergence application of Atrazine at 2.0 kg/ha in combination with post-emergence application of 2,4-D at 30 days after sowing but significantly lower seed yield and stover yield was reported in weedy check plots (Table 1). This finding is close conformity with results reported by Prasad (1995) and Singh *et. al.* (1995). Higher profitability (benefit cost ratio) was recorded in weed-free plots and lowest BCR was recorded in weedy check plots.

Table 1: Effect of different weed control treatment in winter maize (*Zea mays* L.)

Treatment	Rate (kg/ha)	Plant Height (cm)	Weed population ($0.25m^2$)	Weed dry weight ($g/0.25\ m^2$)	Weed control efficiency (%)	Weed index (%)	Grain yield (q/ha)	Stover yield (q/ha)	Benefit cost ratio
Weedy Check		180.93	17.00	8.03	1.0	40.57	30.40	113.16	1.212
Weed-free		198.20	19.66	-	-	-	51.16	27.90	1.804
Mechanical weeding at 15 DAS*		186.09	13.66	3.96	34.32	21.03	40.40	115.53	1.497
Alachlor pe/ emergence	1.5	190.71	11.33	2.56	57.54	18.29	41.80	120.60	1.566
Atrazine pre-emergence	2.0	196.53	15.66	1.6	73.46	14.85	43.96	123.53	1.667
2, 4-D at 30 DAS Post-emergence	0.500	183.66	15.66	4.03	33.16	26.65	36.50	113.66	1.443
Mechanical weeding at 25 DAS		189.60	16.66	3.16	47.59	18.66	41.60	116.90	1.541
Alachlor + Mechanical weeding at 30 DAS	1.5	192.28	12.00	2.46	59.20	18.17	41.66	123.10	1.483
Atrazine + Mechanical weeding at 30 DAS	2.0	196.05	9.66	1.53	74.62	6.45	47.66	127.33	1.707
Alachlore + 2,4-D at 30 DAS	1.50+0.500	192.82	12.00	2.03	66.33	16.94	43.00	25.00	1.620
Atrazine + 2,4-D at 30 DAS	2.0+0.500	196.93	9.67	1.54	74.63	8.60	46.76	120.66	1.715
C.D.		8.89	5.32	2.08	-	-	10.51	10.15	-

*DAS = Days after sowing

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SUTIDES ON BIOEFFICACY OF *BEAUVERIA BASSIANA* AND ITS COMPATIBILITY WITH CERTAIN INSECTICIDES USED AGAINST RED GRAM PLUME MOTH, *EXELASTIS ATMOSA (PTEROPHORIDAE; LEPIDOPTERA)*

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ABSTRACT

Two bioassay techniques *viz.* poisoned food technique and insect dip method were adopted in efficacy experiment to comparative study. The effect of *Beauveria bassiana* and two insecticides *viz.* endosulfon (35 EC) and alphamethrin (10 EC) on the mortality rate of *Exelasits atmosa*. Maximum mortality (100%) was observed in 2nd instar larvae treated by 8% *B. bassiana* 0.0 V. endosulfon; treated for 96 hrs by food poison method and in 72 and 96 hrs by insect dip method. Minimum mortality was seen in 4th instar larvae treated by 2% *Beauvera bassiana* for 24 hrs by poisoned food technique. Compatibility test was carried out by poisoned food technique. Between *B.bassiana* and different concentration of endosulfon (0.035%, 0.07% and 0.014%) and alphamethorin (0.015%, 0.03%, 0.06%). Maximum inhibition of vegetative growth was recorded in 0.06% alphamethrin concentration after 96 hrs of incubation and minimum inhibition by 0.035% endosulfon concentration incubated for 24 hours.

Key words *:* Bio-efficacy, *Beauveria bassaian, Exelusits atmosa*, bio-assay technique.

Pulses form on integral part of the vegetarian diet in the Indian subcontinent. More than 78% of the area under pulses is still rain-feed and therefore productivity has not increased. In pigeon pea, Indian contributes to 75% of global production. The most important pigeon pea growing states are Madhya Pradesh, Uttar Pradesh, Maharashtra, Andra Pradesh, Karnataka and Bihar, which altogether account for 80% of production (Ali, 2005) *Exleastis atmosa* Walshinghom (plume moth) is a specific pest of red gram in many part of India. The incidence of this pest on bore gram and lablab is more (Ponwar, 2002).

Though the value of integrated pest management (IPM) in sustainable agriculture has been well recognized. Very little is being adopted at the field level. Indian consumption of bio-agents like entomophage, botanical microbial pesticides and pheramones *etc* is less than 1% of total pesticides consumption of 12% globally. Use of pest avoidance tactics, enhancement of biological pest suppression and adoption of other non-chemical methods of pest management would certainly be able to improve our capabilities in solving much of the pest problems. Keeping in view the effect of chemical pesticides on human health and environment, development of resistance in pests to pesticides and higher level of pesticides residue in food items, there is need to develop suitable alternative to chemical pesticides for use in pest control.

Microbial control is a powerful pest management tactic which involves the purpose full manipulation of pathogenic microorganisms to ensure reduction in resistance of pest. This approach is a part of applied biological control in which the rate of human agency is quite imperative. Like human beings, insect too are attacked by a wide range of microorganism like bacteria, viruses, fungi, nematodes and protozoa resulting in reduction of their number. There is a tremendous potential in the microorganism and their products in the modern integrated pest management programme because of their high degree of multiplicity at a faster rate, high degree of selectivity and specificity restoring beneficial natural fauna and conserving

ecological balance. Coupled with these, their harmless nature to other form of life, failure of insect to develop resistance against these microbes and moreover the compatibility of their product with conventional insecticide have an added impetus in successful exploitation of such microorganisms in insect control. White muscardine fungus, *Beauveria bassiana* has been successfully used for the first time against chinch bug (Srivastava and Faith, 1998). The spores of the fungi were mixed in water and spread on crop. This fungal spores attached to body of host, germinated and produced mycelium and hyphae and killed the host. Different strains of *B. bassiana* have been isolated from many places such as Canada, Japan, California, England and France.

MATERIALS AND METHODS

The study was conducted in Department of plant protection, Allahabad Agriculture Institute-Deemed University, Allahabad. The fungus was isolated from dead *Inderbella quadrinotata*, the guava bark eating caterpillar and the culture was then purified on SDA medium and maintained for use in the various treatments. Then the different concentration (2%, 4%, 6% and 8%) of *B. bassiana* suspension was prepared (Aneja, 2004). For comparative efficacy test of *B. bassiana* and insecticides used against red gram plume moth, two insecticides namely, endosulfon (35 EC) and alphamethrin (10 EC) were taken. For efficacy test, field recommended dose viz. 0.07% and 0.03% of endosulfon and alphamethrin were taken respectively.

Insect dip method : Sterilized petridishes were taken. In each petridishes sterilized filter papers were kept. Insect larvae were dipped in 2%, 4%, 6%, 8% *B. bassiana* suspension, 0.07% endosulfon and 0.03% alphamethrin. Four treated larvae were kept in each plate. Fresh food of the larvae was provided in each petriplates at every two days. For control larvae were dipped in distilled water and then released in the petriplates. Each experiment was conducted for different duration of treatment viz. 21, 48, 72 and 96 hrs. After completing duration of treatments the larvae were transferred in to the fresh, clean and sterilized petridishes. The experiment was conducted for IV[th] instars larvae and the mortality rate of the larvae was noted. The ratio of the insect treated and died gave an index to mortality percentage. Net mortality was calculated after necessary correction with natural mortality by the following formula –

$$\%\text{Net Mortality} = \frac{\%\text{mortality in test-mortality in normal}}{100\%\text{mortality in normal}} \times 100$$

Insecticide were tested at three concentration viz. FR, FR/2 and 2FR. These values were chosen since they cover all concentration recommended for the test product, providing information that could be used in field compatibility test. For compatibility test, poisoned food technique was applied. The design adopted was RBD (Random Block Design). Seven treatments including control of different concentration were applied in experiment and each treatment was replicated by four times. T_0– control, T_1 0.07% endosulfon (FR), T_2 – 0.035% Endosulfon (DR/2) T_3– 0.014% endosulfon (2FR) T_4– 0.03 and alphamethrin (FR) T_5-0.015% alphamethrin (FR/2) T_6-0.06% alphamethrin (2 FR).

RESULTS AND DISCUSSION

The percent mortality of *Exleastis atmosa* was significantly more in T_4 (8% of *Beauveria bassiana*), T_5 (0.07% of endosulfon), T_6 (0.03% alphamethrin), T_3 (6% *B. bassiana*) T_2 (4% *bassiana*) T_1(2% *B. bassiana*) as compared to T0 (control). T_4 is best among the concentration used. T_4 (8%)> T_5 (0.07 endo)> T_6 (0.03% alpha)> T_3 (6%)> T_2(4%)> T_1 (2%)> T_0 (control).

- The percent mortality in 2[nd] instar larvae was significantly more as compared to 4[th] instars larvae.
- % mortality of age was more in 96 hrs, 7 hrs as compared to 48 hrs and 8 hrs. The best effect was seen in 96 hrs.

The radial growth of colony (mm) after 72 hrs of incubation ; was significantly less in T_1 (0.035% endo.) as compared to T_0, T_1, T_2, T_3, T_4, T_5, and T_6. The effect of different concentration of insecticides

Table 1: Effect of *Beauveria bassiana* on second instars larvae of *Exelastis atomosa* when treated for 48 hour (poisoned food technique/food dip method)

Treatment	Number of larvae treated				Number of larvae dies				% mortality	% net mortality
	R1	R2	R3	R4	R1	R2	R3	R4		
T_0 (control)	4	4	4	4	0	0	0	0	0	0
T_1 (2%)	4	4	4	4	1	1	2	0	25.00	25.00
T_2 (4%)	4	4	4	4	2	1	1	1	31.25	31.25
T_3 (6%)	4	4	4	4	2	2	2	2	50.00	50.00
T_4 (8%)	4	4	4	4	2	3	3	3	68.75	68.75
T_5 (0.07% endo)	4	4	4	4	2	2	3	3	62.25	62.25
T_6 (0.03% alpha)	4	4	4	4	1	3	2	2	43.75	43.75

Table 2: Effect of *Beauveria bassiana* on fourth instars larvae of *Exelastis atomosa* when treated for 48 hour (poisoned food technique/food dip method)

Treatment	Number of larvae treated				Number of larvae dies				% mortality	% net mortality
	R1	R2	R3	R4	R1	R2	R3	R4		
T_0 (control	4	4	4	4	0	0	0	0	0	0
T_1 (2%)	4	4	4	4	1	0	2	0	18.75	18.75
T_2 (4%)	4	4	4	4	1	2	2	2	43.75	43.75
T_3 (6%)	4	4	4	4	2	2	2	2	50.00	50.00
T_4 (8%)	4	4	4	4	2	2	3	2	56.25	56.25
T_5 (0.07% endo)	4	4	4	4	2	2	2	2	50.00	50.00
T_6 (0.03% alpha)	4	4	4	4	2	3	2	2	56.25	56.25

against vegetative growth and sporulation of *B. bassiana* was recorded in increasing order T_3 (15.86mm) < T_2 (16.5) < T_1 (16.5) < T_5 (16.25) < T_4 (16.38) < T_6 (17.88) < T_0 (32.38). After 96 hours of incubation the radial growth (mm) of colony was significantly less in T6 (0.06% alpha.) as compared to T_0, T_1, T_2, T_3, T_4 and T_5 there was no significant difference in T_0, T_1, T_2, T_3, T_4, and T_5. The effect of different concentration of insecticides against vegetative growth (radial growth in mm) was recorded in increasing order. T_4(17.13)< T_1(18.25)< T_3 (18.38)= (18.38)< T_5 (18.68) <T_6(20.38)< T_0 (69.38). When we consider all fours things *i.e.* different period of treatment, concentration, instars and methods, it was noted that the minimum net mortality 6.25% was recorded in case of IVth instar larvae when treated with 2% *Beauveria bassiana* suspension by method-1st (poison food method) for the period of 24 hrs. The maximum net mortality 100% were recorded in certain case like, when 2nd instar larvae treated with 8% *B. bassiana* suspension , 0.07% endosulfon solution by 2nd method (larval dip method) for the period of 72 and 96 hrs, 2nd instar larvae treated with 0.03% alphamethrin solution by method 2nd for the period of 96 hrs when 4th instar larvae treated wit 8% *B. bassiana* suspension by method 2nd for the period of 96 hrs. If we take the period of 24 hrs only with 2nd and 4th instar larvae, it was noted that the maximum net mortality 56.25% was seen in case of 2nd instar larvae of *E. amosa* when the larvae are allowed to eating treated pod of pigeon pea with 0.07% endosulfon solution. The minimum net mortality 6.25% was recorded in case of 4th instar larvae treat with 2% *B. bassiana* suspension. When we considered both instars *i.e.* 2nd and 4th instar treated for the period of 48 hours. The maximum net mortality 68.75% was found in case of 2nd instar larvae when treated with 8% *B. bassiana* solution. The minimum net mortality 18.75 was recorded in case of 4th instar larvae treated with 2% *B. bassiana* suspension. If we consider the period 72 hrs. The maximum net mortality 87.5% was noted in case of 2nd instar larvae when treated with 0.07% endosulfon % the minimum net mortality 31.25% was same in both 2nd and 4th instar larval when treated with 2% *Beauveria bassiana* solution. For 96 hrs of treatment, the maximum net mortality 100% was noted in case of 2nd instar larvae when treated with 8% *B. bassiana* suspension or 0.07% endosulfon solution. The minimum net mortality 93.75% was recorded in case of 4th instar larvae treated with 8% *B. bassiana* 0.07% endosulfon or 0.03% alphamethrin separately.

Compatibility Test :

The effect of different concentration of endosulfon (35 EC) and alphamethrin (10 EC) on vegetative growth and sporulation of *B. bassiana* was studied (Aliveria *et al.* 2003). The present study indicate that endosulfon (35 EC) and alphamethrin (10 EC) inhibit the growth of *B. bassiana* with treatment T_1 (0.05% endo.) T_2 (0.07% endo.) T_3 (0.014% endo.), T_4 (0.015% alpha.), T_5 (0.03% alpha.) and T_6 (0.06% alpha.) after 24, 48, 72 and 96 hrs. Anderson and Roberts (1983) have studies on compatibility of *B.bassiana* isolates with insecticides formulations and gave similar results.

REFERENCES

Ali, H and Kuamr, S. 2005. The Hindu, Survey of Indian Agriculture, Madras pp. 54-56.

Aliveria, C.N.; Neves, P.M.O.J. Kowazoe, L.S. 2003. Compatibility between the entomopahogenic fungi *B.barriana* and insecticide used in coffee plantation. *Scientia-Agricola (Brazil)*, 60 (4) : 663-667.

Aneja, K.R. 2004. Experiments in Microbiology Plant Pathology and Biotechnology. 4th Edn, New Age International Pvt. Ltd. New Delhi. pp 437-450.

Panwar, V.P.S. 2002. Agricultural insect pest of crop and their control. Edition (repriat 2002) Kalyani Publisher, New Delhi; 41-43.

Srivatava; R.P, and Fasih (1998) Natural occurrence of *Beauveria bassiana* and entomogenous fungus of mango mealy bug, *Drasicha mangiferae gree. Indian J. of Plant Pathol.*, 6 (1) : 8-10

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STUDIES ON INCIDENCE AND OCCURRENCE OF PLANT-PARASITIC NEMATODES ON GROUNDNUT IN UTTAR PRADESH

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ABSTRACT

A total of 104 soil and root samples were collected from Bareilly, Hardoi and Moradabad districts of Uttar Pradesh. Soil samples were processed and analysed. The results revealed the presence of 10 nematode species belonging to 8 genera. Occurrence of *Rotylenchulus* was predominant based on the distribution index (0.86) followed by species of *Meloidogyne*, *Helicotylenchus*, *Tylenchorynchus*, *Pratylenchus*, *Hoplolaimus*, *Hirschmanniella* and *Hemicriconemoides* in the close association with groundnut crop.

Key words: *Distribution, groundnut, plant - parasitic nematodes.*

Groundnut (*Arachis hypogaea* L.) occupies the first place among oil seed crops grown in India with an area of 8.0 million ha and contributes 7.5 million tones to oil seed basket (Anonymous, 2004). In India U.P. is one of the major producer of groundnut accounting 0.11 million ha area and 0.10 million tones annual production. Due to high amount of protein oil it is more prone to the attacks of insect, pests and nematode diseases. Nematodes are one of the major constrain in the production of the groundnut crop. Prasad (1984) reported few parasitic nematodes on groundnut from U.P. and Gujarat states. Exept few stray reports, no systematic work on distribution of the nematodes associated with groundnut crop was carried out with view to augment more information. A comprehensive survey of groundnut fields in U.P. was done during Kharif season (August-September in 2007) to determine the kind and number of plant-parasitic nematodes in the roots and rhizosphere of the crop.

MATERIALS AND METHODS

A total of 104 soil samples were collected from Bareilly, Hardoi and Moradabad districts of U.P. Soil samples approximately 0.5-1.0 kg were taken from a depth of 5-20cm. Sampling was done in a randomized fashion. Later soil samples collected from the same were mixed together to get a composite sample and 250 g soil from this mixture was processed by Cobb's sieving and decantation technique (Cobb,1918, Schnidler,1961). For specific identification nematodes were killed by hot F.A. 4:1 processed through Seinhorst's glycerol-ethanol method and mounted in anhydrous glycerine on glass slide and were identified following the characters mentioned by Siddiqui (1986) and Jairajpuri and Ahmad (1991).

For endo-parasitic nematodes, roots of groundnut were gently washed free of adhering soil stained in 0.1 per cent acid fuchsin and examined for the presence of nematodes. Wherever necessary, the nematodes were teased out for further examination. The estimation of nematode population was done by multi-chambered counting dish under stereoscopic binocular microscope.

RESULTS AND DISCUSSION

Out of total 104 samples, 32 were collected from Bareilly, 36 from Hardoi and 34 from Moradabad districts of Uttar Pradesh. The frequencies of commonly occurring genera of plant parasitic nematodes expresses as per cent of total

samples yielding each parasitic forms were *Rotylenchulus reniformis* 86 per cent, *Meloidogyne arenaria* 67 per cent, *Tylenchorynchus vulgaris*+*T. nudus* 66 per cent, *Helicotylenchus dihystera*+*H. elegans* 57 per cent, *Pratylenchus brachyurus*+*P. zeae* 54 per cent and saprophytes were present in almost all samples (Table 1).

The type of plant-parasitic nematodes frequently found in the groundnut fields are discussed below in order of their prevalence (Table 2). *R. reniformis* was found to be widely distributed in all the three districts of Uttar Pradesh. It was predominant in all the collected samples. The population level was 40-380 individual per 250 cc of soil. The fields infected with *R. reniformis* were found to be sickly in appearance, patchy growth, yellowing of leaves and much reduced size of leaf. Symptoms were often confused with minerals deficiencies. It was in high number and thus contributed to poor crop condition and low yield.

Meloidogyne arenaria was the second most prevalent nematode found from Hardoi and Bareilly districts. In Moradabad, it was observed in only Pawasa and Rudryan villages. A few galls with egg sacs of root-knot were observed on nut shell of groundnut in the fields infected with root-knot nematodes. The population level was 10-260 individuals per 250 cc soil.

Tylenchorynchus vulgaris+*T. nudus* was observed in the samples collected from Bareilly and Hardoi only. In Hardoi, it was more prevalent with the population level 20-220 individuals per 250 cc of soil. The high density of the nematode caused the blackening of the pods. Prasad and Rangappa (1991) described the Kalahasti disease due to *T. brevicaudatus* in Andhra Pradesh.

The lesion nematode *Pratylenchus brachyurus* was found most of in Laungpura village of Bareilly, Pratapnagar and Sadi villages of Hardoi, Sikanderpur and Nibora villages of Moradabad with the population level of 20-180 individual per 250 cc soil. However, roots were having black to brown lesions but no infestation was observed on nut shell. Venter (1992) reprted that *P. brachyurus* was the predominant nematode on groundnut crop in South Africa.

Helicotylenchus dihystera was associated with groundnut especially in Nibora and Rudayan villages of Hardoi and Pratapnagar and Murolli of Moradabad. The population level was 10-190 nematodes per 250 cc soil. The role of *H. dihystera* in disease cannot be ruled out.

Table 1: Distribution index of phyto-nematodes associated with groundnut in Uttar Pradesh

Phytonematodes	Distribution index
Rotylenchulus reniformis	0.86
Meloidogyn arenaria	0.67
Helicotylenchus dihystera+*H.elegans*	0.57
Tylenchorhychus nudus +*T. vulgaris*	0.67
Pratylenchus brachyurus	0.54
Hirchmaniella mucronata	0.42
Hoplolaimus indicus	0.32
Hemicriconemoides cocophilus	0.11
Saprophytes	1.0

$$\text{Distribution Index} = \frac{\text{Number of samples showing occurence}}{\text{Total number of samples collected}}$$

Table 2: Distribution of phyto-nematodes associated with groundnut crop in Bareilly, Hardoi and Moradabad districts of U.P.

District	Name of village	*Rotylenchulus reniformis*	*Meloidogyne arenaria*+*M. incognita*	*Tylenchorynchus nudus*+*T. vulgaris*	*Pratylenchus brachyurus*+*P. zeae*	*Helicotylenchus dihystera*+*H. elegans*	*Hirchmaniella mucronata*	*Hoplolaimus indicus*	*Hemicriconemoides cocophilus*	Saprophytes
Bareilly	Dakaria	++	++	+	+	+	+	+	+	++
	Laungpura	+++	+++	+++	++	+	+	+	+	++
	Nandakund	+	++	+	+	+	+	+	+	++
	Sisaiya	++	++	+	+	+	+	+	+	++
	Pachali	+	+	+	++	+	+	+	+	++
	Durgapur	++++	++	+	+	+	+	+	+	++
Hardoi	Sadi	++	+++	++	+	+	+	+	+	++
	Pratapnagar	+++	++	+++	+	+	+	+	+	++
	Murolli	++++	+	+	+	+	+	+	+	++
	Ujhapur	+++	+	+	+	+	+	+	+	++
	Pawasa	++	++	+	++	+	+	+	+	++
Moradabad	Rudayan	+++	+++	+	+	++	+	+	+	++
	Sikanderpur	+	-	+	+	+	+	+	+	++
	Nibora	+	-	+	+	+	+	+	+	++
	Dabi	++	-	+	+	+	+	+	+	++

Where + =1-100, + + =100-200, + + + =200-300, + + + + =300-400 nematodes/250 cc soil and - =nil.

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EVALUATION OF DIFFERENT OKRA CULTIVARS AGAINST YELLOW VIEN MOSAIC VIRUS UNDER FIELD CONDITION

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ABSTRACT

Evaluation of different okra Bhindi (*Abelmoschus esculentus* (L.). Monench] cultivars against yellow vein mosaic virus (YVMV) under field condition were carried out during February 2006 – May 2006 (*zaid* season) at agriculture research from at Allahabad Agricultural Institute-Deemed University, Allahabad. It was found that all the varieties under trailed were infected by the virus with varied percentage of infection. No variety showed immune response against bhindi yellow vein mosaic virus under field condition. During *Zaid* season of 2006, the lowest infection was recorded on Punjab-7 (15.56%) and the highest infection was recorded on Hissar Unnat (65.93%) and was followed by the varities like pusa makhanali (64.44%), varsha uphar (53.33%), VRO-5 (34.82%), VRO-6 (3184%), Parani kranti (28.16%), Arka Abhay (25.18%), Prabhani kranti (check) (22-76%) LORM-1 (22.22%) and D-1-85-5 (21.44%) respectively at 90 days after sowing.

Key words: *Yellow vein mosaic virus, infection okra cultivars.*

Okra (Bhindi, Lady's finger) belong to the family Malvaceae, genus *Abelmoschus* and species *esculentus*, there are a large number of varieties of okra and they may be classified according to the height of the plant as well as the pod quality.

There are many numbers of insect pests and disease which attack on okra crop. Among them yellow vein mosaic virus (YVMV) disease is one of the most serious disease and infect all plant part including fruit, which causes significant reduction in fruit yield and quality (Srivastava *etal* 1995). It has been unequivocally accepted that white fly (*Bemicia tabaci* Genn.) acts as a vector for the spread of the disease. Infection of yellow vein mosaic virus (YVMV) under natural field conditions in a vegetable growing area depends on the environmental parameter. Crop characteristics and efficient vector population (Sharma *et al.*, 1987 susceptibility of cultivars encourages its incidence in the field in presence of the active vectors.

The disease is characterized by yellowing of veins. In severe case of infection entire leaf turns yellow. The infested plants show stunted growth and bear a few yellow colored fruit. Most affected plants develop thickening of leaves on their lower sides; this cause up to 94% loss in yield.

An attempt is therefore made to study the seasonal incidence of yellow vein mosaic virus of okra in relation to the prevailing weather conditions.

MATERIALS AND METHODS

Evaluation of different okra [*Abelmoschus essulentus* (L) Moench] cultivars against YVMV under field condition were carried out during February 2006- May 2006 at research farm Allahabad Agricultural Institute-Deemed University Allahabad. The materials and methods employed for the present study are as follows.

Cultivation of okra:- The present study was carried out on different varities of okra viz. Akra Abhay. Parvani kranti, LORM-1 VRO-5 VRO-6, Hissar Unnat, Varsha uphar, D-1-85-5, pusa Nakhanali, Punjab-7 and prabhant kranti. All the recommended agronomic practices were followed to raise the crop except plant protection measures, which enable the build up to insect pests and yellow vein mosaic virus in a pesticide free environment.

Seasonal incidence of white fly *Bemicia tabaci*:- Observation on the white fly incidence was also recorded simultaneously on fifteen randomly selected okra plants from each cultivars.

Surveys on the incidence of bhindi yellow vein mosaic virus disease:- Bhindi yellow vein mosaic of YVMV disease was rated according to the visually 3-severe; viz., 0-free of infection ; 1-traces; 2-mild korner. The percent incidence of YVMV disease was then calculated through the method adopted by Singh (2002). The data was than analyzed by disease rating scale and means YVMV disease % was correlated by whither parameters.

Evaluation of disease intensity and its correlation with white fly infestation on different varieties of okra.:- Observation on the disease intensity of yellow vein mosaic disease as taken by counting the number of plant infected by yellow vein mosaic virus as well as the total number of plants from each plot at fifteen days intervals. Simultaneously, disease intencity of yellow vein mosaic disease was vetted according to visual grading, viz 0- free I traces, II-mild severe and IV very server on replication bases. The percent intencity of yellow vein mosaic disease was then calculated and correlated with vector on different cultivars of okra.

$$\%\ \text{infection index} = \frac{\text{Sum of disease intensity}}{\text{Max grade x total no. of plants}} \times 100$$

Disease rating scale:-

Plant infected I disease	Score	Disease reaction
0	0	
1.25	I	Resistant
26.50	II	Moderately resistant
51.75	II	Moderately susceptible
775	IV	Susceptible
		High susceptible

RESULTS AND DISCUSSION

The minimum average white fly population per leaf and percentage of minimum disease incidence were recorded in Hissar Unnat and Pusa makhamali at 6th week of February (9th standards week), while in Arka Abhay, Parvani kranti, Varsha uphar and D-1-87-5 at 2nd week of march (11th standard week) and in LORM-1 VRO-5, VRO-6, Punjab-7 and prabhani kranti (check) at 4th week of march (13th standard week). The disease incidence increased and reached peak level at 63 days after sowing i.e., 2nd week of April (15th standard week) and remain constant at 91 days after sowing i.e., 2nd week of may (19th standard week) in 25.18% in Arka Abhay, 28.16% in Parvani kranti, 34.82% in VRO-5 65.93% in Hissar Unnat, 53-33% in Varsha uphar and 15.56% in Punjab-7. In some verities disease incidence increased and reached peak level at 77 days after sowing i.e., 4th week of April (17th standard week) and remain constant at 91 days after sowing i.e., 2nd week of may (19th standard week) in 2.22% in LORM-131.84% in URO-6, 21.49% in D-1.85-5, 64.44% in pusa makhamali and 22.96% in prabhani kranti (check).

Studies on correlation of white fly population with infection percentage revealed that white fly population exhibited non-significant, putative correlation with infection percentage in Arka Abhay, LORM-1 and D-1-87-5 and significant positive correlation with infection percentage in parvani kranti,

Table 1. Percentage of infection of bhindi yellow vein mosaic virus (YVMV) recorded on different cultivars at different days after sowing (DAS) in *zaid* season 2006 in Allahabad region.

Variety	Infection (%) (average of three replication)					
	15 DAS	30 DAS	45 DAS	60 DAS	75 DAS	90DAS
Arka abhay (V1)	0.0	3.71	23.71	25.18	25.18	25.18
Parvani kranti (V2)	0.0	5.18	16.29	28.16	28.16	28.16
LORM-1(V3)	0.0	0.0	8.16	21.49	22.22	22.22
VRO-5 (V4)	0.0	0.0	3.71	34.82	34.82	34.82
VRO-6 (V5)	0.0	0.0	19.27	24.40	31.82	31.84
Hissar unnat (V6)	2.22	20.73	57.04	65.93	65.93	65.93
Varsha uphar (V7)	0.0	5.93	57.04	53.33	53.33	53.33
D-1-87-5 (V8)	0.0	2.22	42.22	20.73	21.49	21.49
Pusa makhamali (V9)	2.96	28.16	2.60	61.49	64.44	64.44
Punjab-7 (V10)	0.0	0.0	55.56	15.56	15.55	15.56
Prabhani kranti (check	0.0	0.0	11.11	22.22	22.96	22.96

VRO-5, VRO-6, Hissar Unnat, Varsha uphar, pusa makhamali, Punjab-7, Prabhani kranti (check). The studies indicated that the infection percentage increased with increasing white fly population in all verities of okra.

It was found that all the 11 varieties under trail were infected by the virus with varied percentage of infection No. variety showed immune response against bhindi yellow vein mosaic virus under field conditions. During *Zaid* season of 2006, the lowest infection was recorded on Punjab-7 (15.56%) and the highest infection was recorded on Hissar Unnat (65.93%) and was followed by varieties like Pusa makhamali (64.44%) Varsha uphar (53.33%) VRO-5 (34.82%) VRO-6 (31.84%) Parvani kranti (28.16%), Arka Abhay (2518%), Prabhani kranti (check) (22.96%), LORM-1 (22.22%) and D-1-87-5 (21.49%) respectively at 90 days after sowing.

It was also recorded that none of the varieties included in *zaid* season had resistance to bhindi yellow vein mosaic virus. Most of the varieties showed a higher level of infection irrespective of season. A gradual increased of BYVMV infection in all the 11 varieties has been observed with the increase of the age of the plants. Percentage of incidence of disease gradually increased with the increase of plant age and was observed up to the age of 75 days. The incidence of disease was comparatively lower at the age before 45 DAS but it was found higher at an age between 45 and 60 DAS. Similar observations were recorded by Nath *et al*. (1999).

REFERENCES

Nath, P. and Saikia, A.K. 1993. Assesement of yield loss due to yellow vien mosaic of bhindi (*Abelmoschus esculentus* (L). Moench) in Assam. *J. of Agric. Sci. Soc. of North East India.* 6:87-88

Sharma, B.R.; Sharma, O.P. and Bansal, R.D. 1987. Influence of temperature on incidence of YVMV on okra. *Vege. Sci.*, 14 (1): 65-69

Singh, S.S.; Gupta, P. and Gupta, A.K. 2002 *Handbook of Agricultural Sciences*, Kalyani Publishers, Ludhiana, pp.304-367

Srivastava, P.K.; Srivastava, K.J.; Sharma, H.K. and Gupta, R.P. 1995. Evaluation of different verities of okra against yellow mosaic virus. *News Letter Nat. Hort. Res. Develop. Found.*, 15 (4): 8-10

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SOCIO-ECONOMIC PROFILE OF DAIRY OWNERS IN LUCKNOW DISTRICT OF U.P.

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ABSTRACT

An attempt has been made to study the socio-economic profile of dairy farmers having cattle and buffalo as dairy animals. For the purpose, two blocks of Lucknow district of Uttar Pradesh having better dairy animals had been selected. Restoring proportionate sampling, 108 cow-milk producers and 92 buffalo-milk producers were finally selected for detailed investigation. The respondents were then categorized under small, medium and large farmers on the basis of number of dairy animals. The data were collected through direct interviewing of the respondents as well as through secondry sources and observations also. The study revealed that average size of operational holding of the pooled sample was 2.11 hac. Out of which about 91% of the operational area was irrigated with their own tube-well water, while 14% was irrigated with hired tube-well water. The major crops grown by milk producers are paddy, wheat, oilseeds and fodders. The fodder crops were grown in 5.23% of the total cultivated area. A peep into the economic status of sample house hold revealed that about 55% members of milk-producing households were 'earners'. 25% were 'helpers' and about 20% were 'dependants'. The average milk yield of buffaloes was 10.07 litres per day as compared to cow *i.e.* 5.74 litres per day. The average lactation period for cow and buffalo was found 330 and 271 days, respectively.

Key words : *Socio-economic, dairy owners, farmers*

India is the highest milk-producing country in the world having about 14.5% contribution in the world milk production. The per capita per day availability of milk has increased from 132g in 1950 to 231g in 2004. U.P. is the largest milk producing state of the country with about 17 millions tones of milk production. Despite the dairy development programmes, the unorganized sector remained the key player of the proportion. It is clear that the development of Indian dairy sector during the last 35 years has largely been policy induced and has occurred in a closed economic environment.

The situation is fast changing and as India moves towards globalization, the self-sufficiency in dairy sector achieved through millions of milk producers is likely to be certain due to distortion in the world market. In other words, the milk-producers, prosperity would be affected which in turn may affect changes in production and conjunction pattern of milk at producers' level. With this background, the present study was conducted with the objective to assess socio economic profile of the dairy owners.

MATERIALS AND METHODS

The present study has been conducted in Lucknow district of U.P. because Lucknow falls in Central Plain Agro-climatic Zone of the state and it is a better representative of Uttar Pradesh. Lucknow district has eight blocks. Out of these, two blocks

randomly for detailed investigation
sampling units. The selection of villages formed the
second stage in the sampling plan. Five villages were
selected randomly from each chosen block. The milch
animal keepers in the selected villages were viewed
as consisting of 2 strata viz., (i) household; having
cows (>80% milk production from cows) and (ii)
households having buffaloes (>80% milk production
from buffaloes). The households from both the strata
were further classified into small (1-3 animals) medium
(4-6 animals) and large category (>6 animals) on the
basis of the number of milch animals (cows/buffalos)
reared by them. Two hundred producers as per
classification shown in Table 1 were randomly selected
according to the probability proportional to the total
number of households under each category.

Thus, a total of 108 cow milk producers and
92 buffalo milk producers were selected for detailed
analysis. The data were collected in the well-developed
and pre-tested schedules through personal interview
of the respondents. Data from secondary sources and
observations were also collected.

RESULTS AND DISCUSSION

Socio-economic profile of the sample households was studied to see whether there is any significant contribution of social factors in milk production. The major parameters studied were, family composition, economic status, educational status, assets structure, land holding, irrigation, cropping pattern and intensity of cropping.

Family Composition

Table 2 shows that the average size of the family was 6.86 persons comprising about 52% adults and 48% children. The proportion of males was higher than females. The sex ratio was 834 females per 1000 males. The family size of cow rearers was slightly higher (6.89 members) than the buffalo rearers. Kumar (2003) also reported medium family size (5-10 members) among dairy farmers of Bareilly district in Uttar Pradesh.

The composition of the family in term of occupational pattern of the family members are shown

trends were found for cow as well as buffalo
producers.

Education

The educational qualification reflects the
economic awareness, better planning and
making capacity about their dairy enterprises
thus, essential to know about the level of edu
family members of the sample households.

Table 4 indicates that in the poorest
% family members were illiterate. While about
16%, 12% and 10% were educated upto
middle, high school and intermediate
respectively. It was also observed that very
livestock owners were highly educated
graduation (4%) and post-graduation level
Therefore, the livestock owners should be
for better education which can help them to
and adopt scientific dairy husbandry practices.
(2003) found a low to medium level of family
status of SHG members in dairy enterprise.
(1974) also reported positive relationship
education level and milk production.

Size of Operational Holding

The size of land owned by the dairy owners
presented in Table 5. A critical look at the table
that the overall average operational holding per
was found 2.11 ha. The leasing in and the leasing
practices were found amongst the sampled
producers. The extent of leased out area was
than the leased in area. So the owned land
with the milk-producer was higher than
operational holding. The size of operational
was higher on cow-milk producing
compared to the buffalo milk producers.
cultivated area of cow and buffalo milk
households was 2.226 ha and 1.8837 ha, respectively.
The dairy farmers should be educated co-operative
farming to improve upon the effective production
process. Tripathi (1991) and Jamal (1988)
reported the importance of total family resources
enhancing the milk production.

Irrigation Status

Irrigation is one of the most important factors in crop production. The main source of irrigation on selected farms was tube-well water. The area irrigated by tubewell is given in Table 6. A look in to the table reveals that the overall irrigated area under tube-well was 1.66 hectares out of which 83.13% were irrigated with own tube-wells and the rest with hired water. The tube-well irrigation accounted for about 90% of the total irrigated area. The proportion of irrigated areas was higher amongst buffalo-milk producers, however, about 19.55% of the net irrigated area was irrigated with hired water on buffalo rearing households compared to nearly 9.43% on cow-rearing households. This indicates that the buffalo rearers are poor in respect of owned irrigation infrastructure. Therefore, facilities of irrigation should be provided from the Government side to ensure proper growth and production of the dairy sector.

Cropping Pattern

The area devoted to different crops on the farmers of the respondents is presented in Table 7. A look in to the table reveals that during *kharif* season, paddy and jowar were the important crops accounting for 21.68 and 14.08% of the total cropped area. During *rabi* season, wheat and oilseed crops (mustard and toria) were important crops accounting for 28.76 and 19.49% of the total cropped area. Fodder crops (barseem etc.) accounted for 6.02% of the total cropped area of the sampled households.

In *zaid* season, fodder (M.P. Chari) was the important crop grown on about 5.22% of the total cropped area. The cultivation of crops on the farms of the dairy farmers exhibited almost the same pattern. However, the cropping intensity was higher on the farms of buffalo-rearing households (254.76%) compared to 234.50% on cow-milk producing farms.

Livestock Wealth

The livestock wealth on different categories of households is shown in Table 8. The table indicates that on an average about seven livestocks were reared by milk producers. The number of livestocks were higher on cow-milk producers because of relatively more number of cattle young stocks.

The table reveals that small, medium and large-sized cattle farms comprised of 4.57, 9.10 and 15.25 animals, respectively. The corresponding figures for small, medium and large buffalo farms were 3.42, 6.15 and 14.29 animals, respectively. About 64.70% animals of cow-rearers and 86.87% of buffalo-rearers were having milch animals. The main dairy cattle breeds reared by milk producers were Jersey, Haryana and Sahiwal whereas the main milch buffalo breeds reared was Murrah (Table 9). The milk producers of large categories were having fund to rear higher proportion of improved breeds as compared to small category milk producers. On an average, cow-rearers were having 4.57 cows in-milk whereas buffalo-rearers were having 5.22 buffalos in-milk. The average daily milk production per cow was 5.741 liters while the average daily milk-production of buffalo was 10.070 liters. The per day milk yield was found to increase with the size of the milk producing herd. This may be due to better management practices followed on larger livestock farms as compared to smaller ones. The large farmers were found to sell their milch animals whenever their milk yield decreased and they purchased new ones to maintain milk production / supply on their farm, hence the yield of their farms was found higher.

The milk yield was also recorded for different duration of parturition (Table 10) and it was found that the milk yield was highest for the duration between 4-6 months of parturition for both cows and buffaloes. Cow-milk yield during 4-6 month duration was 9.66 % higher than the 0-3 month duration and 7.73 % higher as compared to the later period i.e. beyond six months. The corresponding figures for buffalo milk yield were 3.22 and 7.66%, respectively. The lactation period, on an average, for cows was 271 days and for buffaloes it was 330 days. The lactation period was higher on small holders as they continue to maintain the milch animals even when milk yield of animal decrease whereas, large category milk producers sold their milch animals whenever their production goes down.

Table 1: Category wise distribution of sample household in the study area

Category of household	Number of milch animals	Total available cases	Cases selected	Cow rearers	Buffalo rearers
Small	1-3	600	100	61	39
Medium	4-6	400	67	30	37
Large	6 and above	200	33	17	16
Total	-	1200	200	108	92

Table 2: Family composition of sample households

Group	Number of cases	Members per family				Total	Sex ratio
		Adult		Children			
		Male	Female	Male	Female		
Cow rearers	108	27.28	24.38	26.13	22.21	100 (6.89)	872
Buffalo rearers	92	28.05	23.49	27.61	20.85	100 (6.81)	797
Overall	200	27.70	23.91	26.82	21.51	100 (6.86)	824

Note: Figure in parenthesis are average number of family members, * sex ratio is the number of females per 1000 males

Table 3: Occupational pattern of sampled household

Group	Earners	Helpers	Dependents	Total
Cow rearers	54.72	24.82	20.46	100 (6.89)
Buffalo rearers	54.92	25.84	19.24	100 (6.81)
Overall	54.66	25.36	19.98	100 (6.86)

Note: Figure in parenthesis denote percentage total number of family members of all the sampled household

Table 4: Level of education of sampled household

Level of education	Cow rearers	Buffalo rearers	Overall
Illiterate	29.93	31.31	30.61
Primary	29.50	25.85	27.09
Middle	16.40	15.07	15.74
High school	11.22	13.00	12.09
Inter	8.63	10.34	9.49
Graduation	3.16	3.10	3.13
Post graduation	1.15	1.33	1.25
Total	100 (695)	100 (677)	100 (1372)

Note: Figure in parenthesis denote percentage total number of family members of all the sampled household

Table 5: Average size of operational holding among the dairy farmers

Group	Number of cases	Owned land	Leased in area	Leased out area	Total operational area	Area not available for cultivation	Net cultivated area
Cow rearers	98	2.37	0.053	0.15	2.273 (100.00)	0.047 (2.06)	2.226 (97.94)
Buffalo rearers	79	2.01	0.103	0.22	1.893 (100.00)	0.056 (2.95)	1.837 (97.05)
Overall	177*	2.21	0.08	0.18	2.110 (100.00)	0.051 (2.41)	2.059 (97.59)

Note: Figure in parenthesis are percentage to total area, * the 23 landless milk producers are included.

Table 6: Irrigation status of sample household

Group	Area irrigated by			Unirrigated area	Total area
	Owned tubewell	Hired tubewell	Total area		
Cow rearers	78.96	0.43	89.39	10.61	100 (2.226)
Buffalo rearers	72.82	19.59	92.21	7.79	100 (1.837)
Overall	77.22	13.60	90.82	9.18	100 (2.059)

Note: Figure in parenthesis are net cultivated area in ha.

Table 7: Cropping pattern on farms of sampled households

(Per cent)

Crops	Cow rearers	Buffalo rearers	Overall
Paddy	21.83	21.36	21.67
Bajra (Fodder crop)	0.57	0.64	0.60
Arhar	0.38	0.42	0.40
Other Kharif crops, Jowar etc.	14.56	13.67	14.08
Total Kharif Crops	37.16	36.11	36.82
Wheat	29.11	28.41	28.77
Oilseed crops (Mustard & Toria)	18.39	20.94	19.51
Fodder crop (Berseem etc.)	6.32	5.76	6.03
Other Rabi crops	3.25	3.20	3.21
Total Rabi crops	57.08	58.33	57.54
Fodder crops (M.F. Chari etc.)	5.17	5.34	5.23
Casarina	0.57	0.21	0.40
Total Eaid crops	5.74	5.55	5.63
Total Cropped area	(5.22) 100	(4.68) 100	(4.97) 100
Net cultivated area	(2.226)	(1.837)	(2.059)
Cropping intensity (%)	234.50	254.76	241.38

Note: Figure in parenthesis are area in ha. The percentage have been worked out taking total cropped area as base.

Table 8: Livestock rearing on sampled households

Groups	Household (Nos)	Cows	Buffaloes	Bullocks	Cattle young stock	Buffalo young stock	Ovines	Others	Total Livestock
Cow rearers									
Small	61	64.15	2.63	0.43	28.44	-	4.37	-	100 (4.57)
Medium	30	59.34	4.39	1.64	31.34	-	3.39	-	100 (9.10)
Large	17	62.69	3.29	5.57	27.67	-	-	0.78	100 (15.25)
Overall	108	80.91	5.35	2.38	28.62	-	2.48	0.26	100 (7.65)
Buffalo rearers									
Small	29	13.15	75.43	0.58	-	6.46	4.38	-	100 (3.42)
Medium	37	4.06	81.30	1.62	-	9.75	3.27	-	100 (6.15)
Large	16	3.14	85.44	0.87	-	9.59	-	0.76	100 (14.29)
Overall	92	5.62	81.71	1.09	-	9.06	2.18	0.34	100 (6.40)
Total	200	37.85	57.14	1.83	16.66	3.81	2.40	0.28	100 (7.08)

Note: Figure in parenthesis are number of total livestock.

Table 9: Dairy animals on sampled households

Group	Households (Nos.)	In-Milk animals			Breeds (%)					
		Cows	Buffaloes	Total	Cattle				Buffalo	
					Jersey	Sahiwal	Haryana	Others	Murrah	Others
Cow-rearers										
Small	61	96.62	3.38	100 (2.95)	22.29	13.79	28.73	34.48	-	-
Medium	30	94.74	5.26	100 (5.70)	27.78	12.34	24.69	35.18	-	-
Large	17	94.89	5.11	100 (9.80)	31.64	25.32	22.15	20.88	-	-
Overall	108	95.41	4.59	100 (4.79)	27.33	17.0	25.30	30.36	-	-
Buffalo-rearers										
Small	39	13.46	86.57	100	-	-	-	-	40	60

				(2.98)						
Medium	37	4.76	95.24	100 (5.25)	-	-	-	-	48.65	51
Large	16	3.57	96.43	100 (12.60)	-	-	-	-	51.28	48
Overall	92	6.11	93.89	100 (5.56)	-	-	-	-	47.92	52
Total	200	50.09	49.91	100 (5.23)	-	-	-	-	-	-

Note: Figure in parenthesis are total number of milch animals on the farm.

Table 10: Parturition period and average daily milk production of cow and buffalo on sampled households

Group	Period-wise milk yield (litres per day)				Lactation period	Average dairy herd size (animals)
	0-3 months period	4-6 months period	Above 6 months	Overall		
Cow rearers						
Small	5.50	6.05	5.73	5.597	280	2.85
Medium	5.63	6.12	5.64	5.759	269	5.40
Large	5.67	6.25	5.68	5.883	265	9.30
Overall	5.59	6.13	5.69	5.741	271	4.57
Buffalo-rearers						
Small	9.60	9.90	9.18	9.734	340	5.58
Medium	9.95	10.20	9.81	10.025	326	5
Large	10.10	10.50	7.79	10.288	323	12.15
Overall	9.93	10.25	9.52	10.070	330	5.22

REFERENCES

Kumar, S. 2003. A study on Self Help Groups in Dairy Husbandry. *M.V.Sc. thesis*, IVRI, Izatnagar.

Jhon, A.J. 1974. The relationship of cattle owners of personal characteristics with milk production in cross breeding scheme, Chalkudy, Kerala. *M.Sc. thesis*, NDRI, Karnal.

Jamal, S. 1989. A study on role dynamics of farm women in relation to productivity of dairy animals. *Ph. D. Thesis*. IVRI, Izatnagar.

Tripathi, H. 1991. Productivity of milch animals and employment generation for rural women. *Ph. D. Thesis*. IVRI, Izatnagar.

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ASSESMENT OF WATER QUALITY OF SELECTED TUBEWELLS IN NAINI TOWN OF ALLAHABAD DISTRICT, U.P., INDIA

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ABSTRACT

The paper deals with analysis of physico-chemical characteristics of borewell and municipal water of Naini Town. Three different ground water samples (from borewell) and municipal water sample from Auto stand of Naini region were collected and analyzed. The values obtained were compared with standards prescribed by WHO and IS11050091. In the present study, the physio-chemical characteristic of three water samples were within the prescribed limit. One water sample showed high values of T.D.S., T.H., Cl-, T.A. and low D.O. values indicating poor water quality. The significance of the results is discussed.

Key words: *Physico-chemical parameters, ground water, contamination*

Water one of the precious commodities is extremely essential for the survival of all living beings. Industrial waste and the municipal solid waste are the leading causes of pollution of surface and ground water. Contamination of water resources available for household and drinking purposes with heavy elements metal ions and harmful microorganisms is one of the serious health problem (APHA, 1989).

The rapid growth of urban areas has further affected the ground water quality due to over-exploitation of resources and improper waste disposal practices (Baligar and Ghavadi, 2004; Manivaskam, 2005). Considering above aspects of ground water contamination, the present study was undertaken to investigate the quality of ground water quality in Naini town of Allahabad district.

MATERIALS AND METHODS

Naini town is in Allahabad district and located on the bank of Yamuna river. The town lies at north east region of Allahabad district. The people are using borewell water as well as municipal water for their daily need carried out by selecting four different sites from Naini town. Water samples were collected from four sampling points of different locality of Naini during periods of six months (July 2008 to Dec. 2008) the sampling points and places were given in Table 1.

Water samples were collected in plastic canes of 3 litre capacity as per standard procedure. The physico-chemical parameter, such as pH, temperature, electrical conductivity (EC), total dissolved solids (T.D.S.), turbidity, dissolved oxygen (D.O.), total alkalinity (T.A.), total hardness (T.H.),

Table 1: Sampling points and places

S. No.	Sampling Point	Places
1.	A	Mawaia (Tubewell)
2.	B	Cotton mill (Tubewell)
3.	C	Mewa lal bagia (Tubewell)
4.	D	G.E.C. (Municipal Water)

calcium (Ca^{++}), magnesium (Mg^{2+}), sodium (Na^{+}), potassium (K^{+}), chloride (Cl^{-}), sulphate (SO_4^{2-}), nitrate (NO_3^{-}) were determined using standard methods employed by Patil *et al.* (2001), Purandara *et al.*, (2003) and Shriniwasa and Venkateshwara, (2000). Reagents used for the present investigation were AR grade and distilled water was used for preparing various solutions.

RESULTS AND DISCUSSION

The average value of physico-chemical parameters are presented in Table 2. The pH is a measure of the intensity of acidity or alkalinity and gives the concentration of hydrogen ions in water. It has no direct adverse effect on health but a low value of pH below 4.0 given sour taste of water and higher value above 8.5 shows alkaline taste by Singh, (2006). In the present study in pH value of water samples varied between 6.1 to 7.6 and were within limit prescribed by WHO. Electrical conductivity (E.C.) value signifies the amount of total dissolved salts. E.C. values varied from 498 to 2918 µ mhos/cm which reveals that E.C. values for all tubewell samples were greater than the prescribed limit. The EC value for samples (498 µ mhos/cm) was found within the limit.

Total dissolved solids (T.D.S.) indicate the general nature of water quality or salinity of water containing more than 500 mg/l TDS is not considered desirable for drinking water supplies, but in unavoidable cases 1500 mg/l is also allowed (Reddy, 1981). In the present investigation, TDS values varied from 158 to 1085 mg/l. It shows that samples A and B have higher values than the prescribed limit given by ISI 10500-91. The highest TDS value in sample A may be due to sewage along with a pond near the sampling points.

Turbidity of water is actually the expression of an optical characteristics property (Tyndall effect) in which the light is scattered by the particles present in water. Turbidity makes the water unfit for domestic purposes, food and beverage industries and many other industrial uses. In the present study, the turbidity value varied between 3.9 to 8.5 NTU and were within the limit prescribed by ISI 10500-91.

Dissolved oxygen (D.O.) is one of important pollution parameters in water assessment and reflects the physical and processes prevailing in the water. The DO indicate the degree of pollution in water present investigation, DO value varies between to 8.0 mg/l. The results indicate that the DO depleted except sample "A" which showed value indicating heavy contamination of organic

The alkalinity of water is measure of capacity to neutralize acids. The alkalinity in caused by carbonates, bicarbonates and hydro Total alkalinity values for borewell samples were to be greater than the values prescribed by WHO.

Hardness of water mainly depends upon amount of calcium or magnesium salts or Hardness of water is objectionable regarding use for laundry and domestic purpose because consumes a large quantity of soap. In the present study total hardness value varied from 169 to 922 mg/l. The values for tubewell samples were higher than the prescribed limit.

The amount of calcium (Ca^{2+}) varies from 26.00 to 117.80 mg/l and the magnesium (Mg^{2+}) content is ranging between 25.30 to 158.10 mg/l which is found within the prescribed limit except sample "A". Sodium(Na^{+}) content varies between 16 to 75 mg/l and found below prescribed limit. Potassium (K^{+}) concentration varied from .6 to 3.4 mg/l. There is no standard values suggested for drinking water by WHO and ISI 10500-91.

Chloride (Cl^{-}) imparts salty taste if present in excess (>250mg/l). People accustomed to high chloride in water are subjected to laxative effects (Trivedi and Goel, 1986). Chloride presence in study area ranged from 70.02 to 485.50 mg/l. Only the sample 'D' was found within prescribed limit. The sulphate (SO^{2-}) content varied between 39.83 to 93.40 mg/l and the nitrate (NO^{3-}) content varied between .043 to .159 mg/l. The sulphate and nitrate values were found within the prescribed limit.

Deviation is shown by tubewell water from municipal drinking water and the standard water WHO indicating that tube well water is polluted. The cause

Table: 2 Average values of physico-chemical parameters with drinking water standards

S.No.	Parameters	Sampling Points				WHO 1993		ISO 10500-91	
		A	B	C	D	Min.	Max.		
1.	pH	6.1	6.8	7.1	7.6	6.7	7.7	6.5-8.5	7-8.5
2.	EC	2918	1850	1497	498	466	2914	1400	-
3.	T.D.S.	1083	520	440	158	160	1080	1000	500
4.	Turbidity	6.5	8.5	3.9	4.5	3.8	8.6	-	-
5.	DO	2.7	5.5	6.6	8.0	2.7	8.2	-	-
6.	TA	614	328	504	140	140	614	120	200
7.	TH	922	520	582	169	168	923	500	300
8.	Ca^{+2}	117.8	96.21	85.65	26.00	25.65	117.8	100	75
9.	Mg^{+2}	158.1	78.53	94.90	25.30	25.34	153.2	150	30
10.	Na^{+}	58.	36	75	16	75	75	200	200
11.	K^{+}	0.60	0.65	2.0	3.4	0.6	3.4	-	-
12.	Cl^{-}	334	485.5	248.9	70.02	69.02	477.5	250	250
13.	SO^{-2}_4	93.40	62.80	65.20	39.83	39.73	93.39	250	200
14.	NO^{-}_3	0.159	0.069	0.040	0.043	0.035	0.158	45	45

(All Parameters are in mg/l except pH, EC and Turbidity-EC in µ mhos /cm, Turbidity in N.T.U)

of pollution appears to be sewage. The quality of water in the sample A is inferior as compared to other water samples probably due to sewage pond is very close to hand pump. The water sample 'A' is highly polluted and unfit for drinking purpose. Similar observations made by Baligar and Chavadi (2004) and Manivaskam, (2005).

REFERENCES

American Public Health Association 1989. *Standards Methods for the examination of water and waste water. 17th Edn.* Washington, DC.

Baligar, M.B. and Chavadi, V.C. 2004. Degradation of water resources. *Environ. and Ecol.* 22 : 167.

Manivaskam, N. 2005. *Physico-chemical Examination of Sewage and Industrial Effluent. 5th Edn.* Pragati Prakashan, Meerut.

Patil, P.R., Badgujar, S.R. and Warke, A.M. 2001. Physico-chemical examination of ground water. *Orient J. Chem.*, 17(2) : 283.

Purandara, B.K., Varadarajan, N. and Jayashree, R. Study of nature of water with relation to pH. *Poll Res.*, 2003, 22(2) : 189.

Reddy, K.R.1981. Dual variation of certain physio-chemical parameters of water in related aquatic system. *Hydrobiol.*, 85 : 201-207.

Shrinwasa, Rao B. and Venkates Warlu P., 2000. Water quality and its effect on human health. *J. Env. Prot.*, 20(3) : 161.

Singh, V. 2006. Analytical study of drinking water resouces. *Res. J. Chem. Envira.*, 10(3): 62.

Trivedi, R.K. and Goel, P.K. 1986. *Chemical and biological methods for water pollution studies* Enal Publication, Karad (Maharashtra).

EFFECT OF KAPI-KACHCHU (MUCUNA-PRURIENS) ON WEEKLY BODY WEIGHT GAIN IN WHITE LEG-HORN GROWERS

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ABSTRACT

Present investigation was carried out to study the effect of Kiwanch (Kapi-Kachchu) on body weight gain (kg) in white leg-horn growers. 72 grower birds of white leg-horn were selected and placed in twelve groups with six birds in each. These twelve groups were divided into four treatments having three replications of each, one group was fed with normal layer ration marked as control (T_0) group and rest three groups were fed with grower ration containing 0.5%, 1.0% and 2 percent kiwanch seed marked as treatments T_1, T_2 and T_3 groups, respectively. The study showed that weekly body weight gain in treatment groups were increased significantly.

Key words: *Kapi-Kachchu, weight gain, grower, white leg-horn*

To meet out the optimum requirement of animal protein in daily diet of our huge population, it is recommended to increase the number of eggs along with harvest per birds. From time to time various feed additives like Liv-52, Livol, Nitrovion, Virginiamycin, Flavomycin, Shatavari and Ashwagandha have already been tried. Since the performance of layers depend on the performance of growers, hence present study was taken up to evaluate the effect of the Kiwanch (*Mucuna pruriens*) on birds of white leg-horn growers.

MATERIALS AND METHODS

The experiment was carried out at poultry farm, B.H.U., Varanasi. The duration of the experiment was 36 weeks. The present study was started just after completion of chick phase. 72 grower birds of white leg-horn were selected and placed in twelve groups with six birds in each. These twelve groups were divided into four treatments having three replications of each. One group was fed with normal grower ration marked as control (T_0 group) and rest three groups were fed grower ration with 0.5 percent, 1.0 percent and 2.0 percent Kapi-Kachchu seed marked as treatments T_1, T_2 and T_3 groups, respectively. Debeaking was done in all selected birds at the age of three months in order to prevent the habit of feather pecking. Since the chicks were already vaccinated against Ranikhet F_1 and Marex M_1 by the supplier, no other vaccination except fowl pox was done when the birds attained three months of age. The deworming was done every month. Just 15 days before the commencement of the trial, malathion spray of 1:10 concentration was used to remove the parasites of the birds. For analysis of the data, Completely Randomised Block Design was used (Snedecer and Cochran, 1967).

RESULTS AND DISCUSSION

Weekly live body weight of growers

Table 1 shows an increasing trend in weekly live body weight from 9th to 18th week of age in all the treatment groups. Maximum body weight was recorded on 18th week in all the treatment groups. In 18th week, the maximum body weight was observed in T_1 (1.358 kg) followed by 1.263 kg in T_2, 1.263 kg in T_3 and lowest 1.116 kg in T_0 group. Highly significant differences between the treatments in respect of live body weight of growers were recorded on all the weeks from 9th to 18th week of age. Table 1 indicates that differences in the live body weight between T_1 and T_2 was found non-significant in all weeks (9th to 18th weeks). The non-significant difference was also observed between T_1 and T_3 in the 9th and 10th week. In the 18th week, the non-significant differences is also seen between

Table 1: Effect of Kapi-Kachchu (*Mucuna pruriens*) on average live body weight (kg/bird) in different group of growers

WEEKS	TREATMENT GROUPS				F. Value	CD	±SEM
	T_1 (2.00%)	T_2 (1.00%)	T_3 (0.50%)	T_4 (0.00%)			
9	0.578a	0.531ab	0.460 bc	0.415 c	91.9**	0.081	0.007
10	0.673a	0.623 ab	0.541 bc	0.486 c	113.4**	0.083	0.007
11	0.760a	0.710 ab	1.623 c	0.561 d	151.00**	0.079	0.007
12	0.860a	0.803 ab	0.703 c	0.640 c	116.8**	0.097	0.008
13	0.956a	0.893 ab	0.788 c	0.721c	11.5**	0.097	0.008
14	1.048a	0.985 ab	0.870 c	0.806 c	148.6**	0.096	0.008
15	1.138a	1.070 ab	0.948 c	0.890 c	30.8**	0.069	0.006
16	1.220a	1.150 ab	1.020 c	0.960 d	57.7**	0.051	0.004
17	1.306a	1.228 ab	1.103 c	1.046 d	126.4**	0.035	0.002
18	1.358a (21.68)	1.263 ab (13.17)	1.263 ab (13.17)	1.116 b	19.28**	0.267	0.024

NS-Non-significant, *Significant at P<0.05, ** Significant at P<0.01; ±SEM- Standard Error of Means; Similar superscription in the horizontal row indicate non-significant difference between the means of the treatment; The figures in parenthesis indicate improvement in terms of percentage in comparison to control

Table 2: Effect of Kapi-Kachchu (*Mucuna-pruriens*) on average weekly body weight (kg/bird) in different group of growers

WEEKS	TREATMENT GROUPS				F. Value	CD	±SEM
	T_1 (2.00%)	T_2 (1.00%)	T_3 (0.50%)	T_4 (0.00%)			
9	0.091a	0.080ab	0.070 ab	0.065 b	19.57**	0.028	0.002
10	0.095a	0.091 ab	0.081 ab	0.071 b	27.2**	0.021	0.001
11	0.095a	0.088 ab	0.081 ab	0.075 b	15.28**	0.021	0.001
12	0.093a	0.091 ab	0.080 ab	0.080 b	9.85*	0.012	0.002
13	0.096a	0.091 ab	0.085 ab	0.081 b	10.83**	0.015	0.001
14	0.091a	0.090 ab	0.081 ab	0.083 ab	5.84*	0.008	0.001
15	0.090	0.088	0.078	0.083	2.21^{NS}	–	0.001
16	0.081a	0.078	0.080	0.078	0.61^{NS}	–	0.003
17	0.086	0.076	0.075	0.078	3.22^{NS}	–	0.002
18	0.075 (5.63)	0.076 (7.04)	0.071 (0.0)	0.071	0.76^{NS}	–	0.001

NS-Non-significant, *Significant at P<0.05, ** Significant at P<0.01; ±SEM- Standard Error of Means; Similar superscription in the horizontal row indicate non-significant difference between the means of the treatment; The figures in parenthesis indicate improvement in terms of percentage in comparison to control

the body weight of T_2, T_3 and T_4 treatments. The non-significant difference is also noted between the live weight of growers of T_1, T_4 (9th week) T_2, T_4 (10th week) T_1, T_4 (12th week) T_2, T_4 (in 13th and 15th week). When we see live body weight in terms of percentage, we found 21.68 (T_1), 13.17 (T_2) and 13.17 (T_3) percent more body weight in comparison to the body weight of the control group (T_4).

The above observations indicate that Kapi-Kachchu-fed group birds have gained more body weight in comparison to control group where Kapi-Kachchu has not been fed. The body weight has shown the increasing trend and is more when Kapi-Kachchu mixing is more (2%) but in all cases of Kapi-Kachchu feeding the body weight is more than the control where Kapi-Kachchu has not been fed.

Weekly body weight gain (kg/bird)

Average weekly weight gain of all the treatment groups from 9th to 18th week of age has been shown in Table 1. We find in T_1, the maximum weight gain (96 gm) has been achieved in the 13th week, in T_2 the maximum weight gain (91 gm) has been observed in the 12th and 13th week. The maximum body weight gain (85 gm) in T_3 has been observed in 13th week. In control T_4 group, the body weight gain is delayed and it (83 gm) is observed in the 14th and 15th week. The weight gain trend has resorted in advancing age and in the last week of the experiment in growers, the weight gain have been 75, 76, 70 and 71gm in T_1, T_2, T_3 and T_4 groups, respectively.

A glance at the Table 2 reveals a highly significant difference in weekly weight gains from 9th to 13th week in between the four treatments and non-significant difference from 14th to 18th week. Further analysis on the basis of critical difference (C.D.) shows no significant difference between T_1, T_2 and T_4 from 9th to 18th week of age, the non-significant difference is also seen between T_1, T_2, T_3 from 9th to 18th week except in the 14th week where non-significant difference is in between T_1 and T_2.

The maximum weekly body weight gain in the T_1, T_2, T_3 has been obtained in the 13th week of age.

The weight gain is 18.51, 11.11 and 4.93 % than the weight gain of the control treatment the feed was devoid of Kapi-Kachchu. The gain has retarded and in the last week (18th) 5.63 and 7.04 percent in T_1 and T_2 in comparison the control T_4 group. In T_3 the weight gain has to 1.40 % in comparison to the control treatment.

As evident from these observations, it is clear that all the Kapi-Kachchu (*Mucuna pruriens*) fed experimental groups have shown more body gain upto 13th week in comparison to control of growers kept on the same feed but without Kachchu.

Our findings regarding impact of fenugreek stimulator Kapi-Kachchu on live body weight body weight gain in growers agrees well with observations made by Majadanski (1991) and (1992) who also observed that the mixing of the stimulator (herbs) of flavofosfolipol significantly improved the body weight gain and feed conversion efficiency in layer/broilers. Same was also reported by Proud Foot *et al.* (1990) with Linomycin and Kralik *et al.* (1990) with flavomycin.

REFERENCES

Kralik, G.; Mondic, B. and Popovik, B. 1990. Effect of application of growth promoters in production of chicken meat. *Poult. Abst.* 17(10) : 2706.

Majadanski, F. 1991. Herbal feed additions in feeding broiler chicks. *Zeszyty Naukowe Akademii rolniczej we wroclowice weterynaria* 41 67-73.

Proud Foot, F.G.; Hulan, H.W.; Jackson, E.D. and Salsibury, C.D.C. 1990. Effect of Linomycin as a growth promoter for broiler chicks. *Poult. Sci.*, 31(1) : 181-187.

Qost, G. 1992. Effect of feeding-flavifosfolipol to broilers over a 20 period. Beginning 1962 ending 1981. *Poult. Abst.*, 18(3) : 508.

Snedecer, G.W. and Cochran, W.G. 1967. *Statistical Methods*, 6th Edn. The Lowe, State University Press, Amsterdam Lowe.

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ANTAGONISTIC EFFECT OF *TRICHODERMA* STRAINS AGAINST *FUSARIUM OXYSPORUM* F. SP. *UDUM* BUTTER CAUSING WILT OF PIGEON PEA

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ABSTRACT

***Trichoderma viride* isolates from the rhizosphere of healthy pigeon pea plants in wilt-sick plot out other *Trichoderma* isolates collected form (Allahabad University) screened *in vitro* and *in vivo* for their antagonistic effect against the pathogen *Fusarium oxysporum* f. sp. *udum*. Among the bioagent tested, local isolated of *Trichoderma viride* (A.I.) was found to be the most promising showing maximum inhibitory effect on the mycelial growth (87.77) of the pathogen. All bioagent were further tested as seed dressing agents for the control of wilt of Pigeon pea. The lowest incidence of wilt (20.48%) was observed in the plots were seed treatment was given with the local isolates of *T. viride*.**

Key words: *Bioagent, Fusarium udum, control.*

Pigeon pea wilt caused by *Fusarium udum* Butler is one of the most economically important disease in India and other pigeon pea growing countries (Khare *et al.* 1994, Kanniyami *et al.* 1984). Application of fungicides in the soil to control the disease is not practicable prospects of biological control of soil-borne plant pathogens using most promising fungal bio-control agent of the genus *Trichoderma* have been described (Papavizas, 1985, Bhatnagar, 1996., Chang *et al.*, 1986., Nipoti *et al.*, 1993). Successful reduction of *Fusarium* wilt in many crops with application of different species of *Trichoderma* has been recorded (Sivan and Chet, 1986). However, it is also reported that all the isolates of *Trichoderma* species are not equally effective in control of the pathogen *invitro* (Bell *et al.*, 1982) and *in vivo* (Lewis and Papavizas, 1987). Success of any antagonist depends on the selection of a virulent strain, method of application and its proliferation in soil. Therefore, a specific effective native isolates is to be identified for successful control of a particular pathogen. An Attempt was made to evaluate the efficacy of six isolate *Trichoderma* spp. against *F. oxysporum* f. sp. *udum in vitro* and as biological seed dressing agents for the control of pigeon pea wilt.

MATERIALS AND METHODS

In vitro the six isolates of *Trichoderma* used in study were: (1) *T. viride* (AI) isolated by using standard procedures from rhizospher of healthy pigeon pea plant in wilt sick plot at Soram, Allahabad, (2) *T. harzianum*, (3) *T. koningii*, (4) *T. humatum*, (5) *T. pseudokoningii*, *T. viride*, collected from University of Allahabad, Department of Botany, Uttar Pradesh were tested for their efficacy to inhibit growth of *F. oxysporum* f. sp. *udum* in dual culture technique given by Huang and Hoes, (1976) on potato-dextrose agar (PDA). The mycelial disc of one (9 cm) diameter from the margin of seven day old culture of each *Trichoderma* spp. and of the pathogen was placed opposite to each other on PDA plate. Dual plates were incubated at 25±1°C in BOD incubator and the radial growth of the pathogen and test isolate was recorded in each case.

Pathogen alone inoculated on PDA plates served as control. Percentage inhibition of pathogen

by biagent over control was calculated by using the formula (Vincent 1947) culture plates.

Formula: Percent inhibition $= \frac{C-T}{C} \times 100$

C=Growth in control

T= Growth in treatment

In vivo

The experiment was conducted in wilt sick plot at Allahabad for two year during kharif 2006-2007, 2007-2008 and two year old wilt sick plot was developed by addition of wilted pigeon pea plants chopped in the plot every year. The trial was laid out in a (RBD) with plot size of 2×8 m and 60×30 cm spacing between row-to-row and plant-to-plant, respectively. The pigeon pea cultivar (Bahar) was used in the study. Before showing the cultures viz. *T. viride*(A 1), *T. harzianum T. humatum*, *T. koningii*, *T.pseudokoningii* and *T. viride* were applied to seed of pigeon pea @ 2 g of 10-12 day old spore cum mycelial mass per kg seed by shaking in a conical flask for uniform distribution on the seed surface. Observation on wilt incidence were recorded after 60 day of sowing and compared with the control plot.

RESULTS AND DISCUSSION

In vitro

All the bio-agents tested reduced the mycelial growth of the *F.oxysporum f.sp. udum* significantly in dual culture (Table 1.) Highest inhibition (87.77%) of pathogen was observed with the local isolates (A 1) of *Trichoderma viride*, *T. harzianum* inhibited the growth of the pathogen to an extent of 85.55% over control. The other bio-agents viz. *T. humatum*, *T. koningii*, *T. viride* and *T. pseudokoningii* reduced the mycelia growth of the pathogen by 26.3,51.11, 41.85, 38.52 %, respectively. However, the local isolates of *Trichoderma viride* completely covered the *F.oxysporum f. sp. udum* after 14 days of incubation. Therefore the local isolate of *T. viride* (A1) is considered to be most effective bio-agent of *F.oxysporum f. sp. udum*. The antagonism of *T.harzianum* and *T. viride* were reported as antagonistic to *F. udum in vitro* (Bhatnagar, 1996). It was also reported the *Trichoderma* spp. have also been employed in biological control of disease of vegetable crop caused by soil-borne plant pathogens (Dwivedi, *et al.*, 1993).

Table 1. *In vitro* effect of antagonists on the growth of *F. oxysporum f.sp. udum* in dual culture

Antagonist	Radial growth	Percent inhibition
T. viride (A 1)	11.00	87.77
T. harzianum	13.00	85.55
T. humatum	66.33	26.3
T. koningii	44.00	51.11
T. viride	42.33	41.85
T. pseudokoningii	55.33	38.52
Control	90.00	-
(CD(P=0.005)	0.90	-
SEM±	2.71	-

In vivo

In the present study, the bio-agents evaluated *in vitro* were further tested *in vivo* as biological seed dressing agent against *Fusarium* wilt of pigeon pea. maximum reducing of *Fusarial* wilt was observed in the pots where the seeds were treated with the local isolates of *T. viride* (A1) compared to control (Table 2). The next promising isolates in reducing the wilt incidence was *T. horzianum* which recorded 21.69% of wilt the other bio-agent tested viz. *T.humatum*, *T. koningii*, *T. viride* and *T. pseudokoningii* were in percent in reducing the incidence of wilt to 30.22, 25.46, 23.46, and 26.29, respectively. Though the isolates of *T. humatum*, *T. Pseudokoningii* and *T koningii* inhibited the mycelial growth of *F.oxysporum f.sp. udum in vitro*, they were not effective against *Fusarium* wilt in field. The above results indicated that the local isolates *T.viride* were comparatively more

Table 2. Evaluation of antagonists as seed dressing agent's Pigeon pea wilt.

Isolates	Wilt incidence (%)
T. viride (A 1)	20.48
T. harzianum	21.69
T. humatum	30.22
T. koningii	25.46
T. viride	23.46
T. pseudokoningii	26.29
Control	35.82
SEM±	0.41
CD (P= 0.05)	1.32
CV%	2.42

effective in reducing wilt incidence (20.48%). Jayarajan and Rama Krishanan, (1995) have also reported *T.viride* to be effective against *Fusarium* spp.

REFERENCE

Bell. D.K.; Wells, H.D. and Markhns, C.R. 1982. *In vitro* antagonism of *Trichoderma* speices against six fungal pathogen. *Phytopathol.* 72:379-382.

Bhatnagar, h. 1996. Influence of environmental condition on antagonistic activity of *Trichoderma* sp. against *Fusarium udum*. *Indian J. Mycol. Plant Pathol.*, 26:58-63.

Chang, Y. C.; Baker, R.; Kelsfeld, O. and Chet, I. 1986. Increased growth of plant in the presence of the biological control agent *Trichoderma harzianum*. *Plant Dis.* 70:145-148.

Dwivedi S.K.; Ambasht, R.S. and Dwivedi, R.S. 1993. Toxicity of some antagonistic fungi on pathogenic crops. *National Academy Science Letters*. 16:7-8, 209-210.

Huang, H.C. and Hoes, J.A. 1976. Penetration and infection of sclerotinia sclerotiorum by coniothyrium minitans. *Canadian J. Bot.* 54: 406-410.

Jayarajan, R. and Rama Krishna G. 1995. Mass production of *Trichoderma viride* for biological control. *Indian J. Mycol. plant Patho.*, 25 (1&2) : 125.

Kanniyan, J.; Nene, Y.L.; Reddy, M.V.; Ryan, J.G. and Raju, T.N. 1984. Prevalence of pigeon pea disease and associated crop losses in Asia, Africa and the Americas. *Trop. Pest Manage.* 30 (1) : 62-71.

Khare, D.; Satputi, R.G. and Tiwari, A.S. 1994. Present state of the wilt and sterility mosaic disease of pigeonpea. *Indian J. Genet. Plant Breed.*, 54 : 337-346.

Lewis, J. A. and Papavizas, G.C. 1987. Application of *Trichoderma* and *Gliocladium* in pellets for control of *Rhizoctonia* damping off. *Plant Pathol.*, 36 : 438-446.

Nigoti, P.; Manzali, D.; Rivas, F.; Gemari, S. and Ercole, N. 1990. Activity of *Trichoderma harzianum* Rifai on the germination of asparagus seeds. *Acta Hort.*, 271:403-407.

Papavizas, G.C.,1985. *Trichoderma and Gliocladium* their biology, ecology and potential of bio-control. *Ann. Rev. Phytopathol.* 23 : 28-47.

Sivan, A. and Chet, I. 1986. Biological control of *Fusarium* species of in cotton, wheat and musk melon by *Trichoderma harzianum*. *J. Phytopathol.*, 116:39-47.

Vincent, J.H. 1947. Distortion of fungal hyphae in the presence of certain inhibitors. *Nature* 15 : 850.

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SCENARIO OF LIVESTOCK AND DAIRY DEVELOPMENT IN NORTH-EAST REGION

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The cattle raising in India is as ancient as Aryan Civilization. Traditionally, cattle have been raised by people (i) for prestige (ii) as a subsidiary occupation to crop production in rural areas (iii) for meat fuel, cow dung and bullocks etc. To a great extent, this is still the state of affairs. However, through systemic planning by the Government in the form of various dairy development programmes starting from Key Village Scheme (during the first three Five Year Plans), the Intensive Cattle Development Project introduced in sixties, Operation Flood I in 1970, Operation Flood II in 1982 and Operation Flood III in 1994, India has reached the present estimated milk production level of more than 90 million tones /year topping the world in terms of milk production as against production of only 17 million tones in 1950. India at present contributes 11% of the total world milk production. The estimated cattle population in India in 2004 is more than 200 millions which is 15% of the total cattle population in the whole world and India's buffalo population is 54% of the world's buffalo population.

Even though, India has made phenomenal progress in the area of dairy development, the achievement seems to be insignificant when viewed against the challenges faced by the dairy sector. Although, we have huge cattle and buffalo population, but due to huge human population of the country, the per capita availability of milk every day at present is about 230 gm which is quite low, although it is much higher than 125 gm in 1950. It is to be noted that New Zealand tops this list with 8.5 kg/day as per capita availability. Further, very low productivity of milk animals, huge expenditure involved in planning and implementing dairy development projects and under-utilization of the large installed capacities of dairy plants are some of the challenges faced by the country in terms of its dairy development.

Because of socio-economical reasons, there are huge number of small and scattered herds in the country which is a big bottleneck for proper economic viability of dairy development. The investment in dairying has decreased from 82% of the total plan expenditure in the First Plan to 52% in the 9th Five Year Plan. This has caused serious constraints for manpower development, creation of proper communication, infrastructure, reliable database and strengthening of extension network in rural areas. Lack of flow of latest technologies and know-how from labs to the cattle farmers and development of suitable technology to suit different rural areas and its socio-economic condition have been bottleneck in dairy development. The major constraints observed in cross-breeding has been low reproductively through artificial insemination, high incidence of repeat breeding in cross-breeds, indiscriminate breeding and slaughtering of high-yielding animals, ill-equipped artificial insemination centers and inadequate expert services. Approximately 80% of the cattle are non-descript local ones which give hardly 1-2 kg/day. Because of this the average milk production per cow in India is approximately 3 kg/day as against about 25 kg/day for average cow in USA. This shows that the milk production can be increased many-folds by having more and higher breed animals in place of non-descript local animals in phases.

In addition to high genetic cattle, balanced feeding of dairy animals is the basis for successful dairy farming. Poor availability of quality feeds and fodder results in low production of milk, shortage of supply of essential nutrients resulting in poor growth and reproduction. Lack of knowledge on the part of farmers about balanced feed, quality feeds and fodder and lack of organized markets for quality feeds and fodder add to the dimensions of the problem. Another problem in speedy dairy development is lack of facilities and lack of knowledge on the part of dairy farmers about disease prevention and control of cattle.

At present not more than 30% of milk is being processed in the dairy plants under government, organized private and co-operative sectors. The absence of regular and remunerative market for milk products is a major constraints encountered by farmers, especially from rural areas. Lack of inadequate credit facilities to the dairy farmers and exploitation by middlemen hampers the farmers from deriving proper profit from dairying and sometimes causes discouragement and frustration.

Dairy extension activities are always treated as secondary due to which most of the dairy farmers are not aware of various aspects of economically profitable dairy farming and the facilities available to them by various organizations. Inadequate communication, transportation and veterinary services located at far distances also contribute to the dairy development adversely. It calls for a thorough discussion on the part of dairy scientists, policy makers, extension personnel and dairy farmers to address these constraints which may vary in degree from place to place. Use of Participatory Rural Appraisal, more intensive extension activities for effective flow of technologies and informations from labs and other relevant organizations to dairy farmers may help not only in identifying the problems faced by dairy farmers but also in finding possible suitable solutions.

The scenario of dairy development in North-Eastern Region is all the more discouraging. Historically, Shillong being the only important city in N. E. Region, British for their own consumption brought one bull of Holstein-Friesian breed from Orissa and another bull of Brown Swiss breed from Germany and arranged to start a multiple cross-breed cattle farm in Shillong with the help of Nepalese. They encouraged Nepalese to rear cattle. The oldest cattle farm in N. E. Region was the one established in 1924 in Upper Shillong. At one time, there were about 1000 cattle of mixed breeds (Holstein-Friesian, Jersey, Brown Swiss). Another cattle farm was established in Khanapara, Assam in 1926. Artificial insemination was started in Shillong in around 1965. In 1987, during Operation Flood- II, National Dairy Development Board offered the states of N.E Region for production of wholesome milk and its distribution at a reasonable price by collecting milk from the producer's doorsteps regularly paying its remuneration through Anand pattern cooperative system. Only Assam Government accepted the offer in 1987 with establishing Kohima Milk Union Limited (WAMCUL) in 1987. Nagaland followed 5 years later by establishing Kohima Milk Union Limited (KOMUL) in 1992. Assam has taken up an Agricultural Infrastructural Development Project through World Bank in 1998 which is likely to boost dairy development.

The number of high-breed cattles of high rose to 25 lakh in 1965 in N. E. Region which was approximately 30% of the total cattle population. A large number of Nepalese and Biharis were involved in this sector. But due to Nepalese and Biharis Hatao drive by local people of this region, this number has come down to only 18 lakhs at present which is only 15% of the total cattle in N. E. Region. This has happened in a big way in Meghalaya. Because of this, the total annual milk production in Meghalaya which steadily raised from 39,000 tones in 1970 to 64,000 tones in 1984 dropped down to only 46,000 tones in 1985 and could rise to only 62000 tones in 2001.

The largest cooling plant was established at Naya Banglow (near Shillong) in 1962 which is dry due to Nepalese and Biharis Hatao drive in Meghalaya. Subsequently, the Government established another chilling plant along with pasteurizing unit in 1983 in Shillong which is still functioning. One

pasteurization plant was established in Khanapara in 1962 to cater to the needs of dairy farmers around Guwahati.

Amongst 8 states of N.E. Region, Assam is well ahead in terms of milk production (850/1300 thousands tones), milk processing units (9/13), liquid milk plants (9/22), organized dairy cooperative (123/404) and the number of cattle 12000/16000 thousands). After Assam, Sikkim has done significantly well in terms of per capita availability of milk which is around 200 gm as against 80 gm being the average per capita availability of milk in N.E. Region and 125 gm being per capita availability of milk in Assam as in 2000. Sikkim also has (162/402) organized dairy cooperative societies and is top in the list of states in N.E. Region. Nagaland has been doing extremely well during the 4-5 years and the projected per capita availability of milk in 2004-05 was 436 gm/day for Nagaland as against 280 gm/day that of Sikkim and 90 gm/day that of N.E. region and 230 gm/day that of national average. Mizoram's performance is significant in terms of average milk yield/cross breed cattle which are 8.5 kg as against 8.4kg that of Meghalaya, 8.00 that of Manipur 4.5 being average of N. E. Region for cross breed cattle.

Looking at the very low per capita availability of milk in N.E. Region which is around 90 gm/day as against minimum requirement of 250 gm/day for a person as per Indian Council of Medical Research, there is a tremendous scope of dairy development in this region. It will not be out of way to mention here that the annual consumption of Amul Taja (milk) in N.E.Region is more than worth Rs. 28 crores and that of other milk products from Amul is about Rs. 12 crores. Further, annual consumption of milk products at sufficient high cost say Rs. 25/ltr from other companies of West Bengal is also of the order of Rs. 12 crores. Because of lack of availability of fresh milk and its products, people here are compelled to go for Amul and other Companies milk and milk products. If we can increase milk production to fulfill the demand of people here, they will prefer to buy pure fresh milk and its product at a rate about 70% of the rates of Amul Taja and its products which are 3-4 months old. In N.E. Region, Khoa and Chhenna-based milk products are very common. In addition to this to Paneer, and Sweet Dahi is also quite popular. Some of the main bottlenecks in dairy development in this region are (i) lack of awareness and information about dairy prospects, (ii) lack of high quality breeds, (iii) non-availability of quality feed and fodder, (iv) lack of marketing net work, (v) lack of transportation and communication, (vi) geographical constraints, (vii) lack of veterinary hospitals, breeding farms, artificial insemination facilities, (viii) lack of awareness about the nutritional and medicinal value of milk and its products.

Looking at the acute unemployment, this is high time that youth should be encouraged to take up dairy farming/processing/management as self-employment opportunity. Agricultural Universities, Indian Institute of Entrepreneurship, NIRD, SIRD and other related Institutions should give short-term training programmes in different aspects of dairy development. The funding agencies should also come forward in this direction. Dairy farmers should be given required know how and should be encouraged to produce high quality feeds and fodder. ICAR, KVK, KGK, *etc.* may play an active role in this direction. Awareness camp may be organized from time-to-time at block level to create awareness about the nutritional and medicinal value of milk and its products and about dairy prospects in this region. NGOs, academic institutions and ICAR can contribute significantly towards this. Government should establish high pedigree breeding farms, A.I. centers and animal health care units at block level and the dairy farmers should be encouraged to rear high-breed cattle instead of non-descript cattle. They should also be given required know-how about maintenance and management of high-breed cattle. Government should open milk chilling centers, small unit dairy plants at block level.

We are sure that if the above mentioned measures are taken at block level, then within 5 years the production of milk and its products to at least double of what it is today in N. E Region. We have made a humble beginning in this direction by training students of rural development and agricultural

production in dairy farming, by developing a model dairy farm in the campus and by encouraging students to take up dairy as an opportunity for self-employment. We have also conducted some orientation programmes to create awareness in this region. We have also conducted some participating Rural Appraisal programs on neighboring villages. But this is too little and a lot more is to be done. There have been Operation Flood programmes in three phases in the country so far but their important in north eastern region has not been significant. We think north-eastern region needs a special Programme Operation Flood north-east, to boost dairy activities in north-east region. We take this opportunity to appeal to scientists, policy makers, Indian dairy board, ICAR, KGK, KVK, NIRD, SIRD, agricultural universities and other concerned organization. In north-eastern region to jointly come foreward to meet the objectives. This will not only boost dairy development but also give self-employment opportunities to thousands of

Table 1: Annual milk production from 2002-2006 in North-East states

S.No	Name of the states	2002-03	2003-04	2004-05	2005-06
1	Arunachal Pradesh	46	46	48	48
2	Assam	705	727	739	747
3	Manipur	69	71	75	77
4	Meghalaya	68	69	71	73
5	Mizoram	15	15	16	15
6	Nagaland	58	63	69	74
7	Sikkim	45	48	46	48
8	Tripura	79	84	86	87

Table 2: Share of milk production by cows, buffalos and goats in North-East States in 2006 (000 tonnes)

S.No	Name of the states	Cow	Buffalo	Goat
1	Arunachal Pradesh	07	—	—
2	Assam	627	93	27
3	Manipur	63	14	—
4	Meghalaya	72	02	—
5	Mizoram	14	01	—
6	Nagaland	70	03	02
7	Sikkim	48	0.12	—
8	Tripura	83	02	02

Table 3: Total number of livestock in North-East states in 2003 (in 000)

S.No	Name of the states	Cattle	Buffalo	Sheep	Goat	Pigs	Mithun
1	Arunachal Pradesh	458	11	19	211	350	192
2	Assam	8440	678	170	2983	1543	—
3	Manipur	418	77	66	31	415	20
4	Meghalaya	767	18	18	327	419	—
5	Mizoram	36	06	01	17	238	02
6	Nagaland	451	34	04	175	644	40
7	Sikkim	159	02	06	124	38	—
8	Tripura	759	14	01	472	—	—

unemployed youth of north eastern region.

REFERENCES

Anon. 2003. *Meghalaya Socio-Economic Review. Government of Meghalaya.* Directorate of Economics and Statistics, Shillong.

Anon. 2004. *Meghalaya and North East and India and the World. Govt. of Meghalaya.* Directorate of Economics & Statistics, Meghalaya, Shillong.

Anon. 2002. *Meghalaya Achievements in 50 years 1972-73 to 2001-2002. Govt. of Meghalaya.* Directorate of Economics and Statistics, Shillong.

Anon. 2006. *Pocket Statistical Hand Book Meghalaya.* Directorate of Economics and Statistics, Govt. of Meghalaya, Shillong.

Anon. 2002. *Statistical Hand Book of Manipur.* Directorate of Economics & Statistics, Govt. of Manipur, Imphal, 2002.

Anon. 2001. *Mizoram Statistical Hand Book 2006.* Directorate of Economics & Statistics, Govt. of Mizoram, 2001.

Anon. 2005. *Statistical Hand Book of Nagaland 2005.* Directorate of Economics & Statistics, Govt. of Nagaland, Kohima.

Anon. 2006. *All India Dairy Business Directory (Dairy Year Book) 2006 Special Millennium Issue.* Sadaru Publishers & Distributors, Second Edition.

Mudgal, V.D.; Singhal, K.K. and Sharma, D.O. 2003. *Advances of Dairy Animal Production.* International Book Distributing Co.

Ramasamy, D.; Shibu, A.V. and Gopal, H. 1999. *Dairy Technologist's Hand Book.* International Book Distributing Co.

Venkatesubramanian, V.; Singh, A.K. and Rao, S.V.N. 2003. *Dairy Development in India.* Concept Publishing Co., New Delhi.

Winton, A.L. and Winton, K.B. 2000. *Milk and Milk Products.* Agrobis, India.