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STUDIES ON THE EFFECT OF ORGANIC MANURES ON THE GROWTH OF RADISH (RAPHANUS SATIVUS L.) C.V. PUSA CHETKI

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ABSTRACT

Data regarding on effect of organic manures on plant height of Radish at harvesting presented in Table 1. At the harvesting stage (45 DAS) maximum plant height was recorded with the application of (V.C) @ 0.6 tonnes ha^{-1} + Azotobacter @ 700 ml per 10kg seed treatment) (T_6). Data show on Table 2 revealed the effect of organic manures on number of leaves of Radish at harvesting. At the harvesting stage (45 DAS) maximum number of leaves was recorded with the application of (V.C) @ 0.6 tonnes ha^{-1} + Azotobacter @ 700 ml per 10kg seed treatment) (T_6).

Keywords : *Radish, organic manure, growth, vermicompost and poultry manure.*

INTRODUCTION

Radish is the most important root vegetable, being grown widely all over the country. Radish is grown both as annual and biennial are belongs to the genus *raphanus* and species *sativus*. Which comes under the family Cruciferae. It is mainly winter season vegetable crop. Radish is short duration vegetable crop it is popular in both tropical and temperate regions. It is grown throughout the country. However ,West Bengal, Bihar, U.P. , M.P., Punjab, Karnataka, Haryana, Rajasthan and Assam are the major growing states. The edible part of Radish is modified root (fusiform) which developed from both primary root hypocotyl. Due to increasing demand for food supply by the ever growing population, production system using chemicals and fertilizers were adopted. This has changeble effect on the enhancement of production and productivity but not without cost. Land degradation, loss in factor productivity and all health are observed. Which attracted the attention for organic farming for sustainable development. Present status with environment pollution which is harmful to the sustainable production. There is an immediately needed for adoption of organic cultivation practice which maintain health of soil, human, animal and ecosystem. Consequently, people are turning to organically grown foods which provides nutritious and safe food for health.

MATERIALS AND METHODS

This chapter comprise the details about the materials used and the method adopted during the

course of present investigation entitled " Effect of different organic sources of nutrients on growth and yield of radish (*Raphanus sativus* L.) *cv.* PUSA CHETKI" was carried out in summer season during the year 2020-2021.The present experiment was laid out in the field of vegetable research farm, Department of horticulture K.A.P.G. College, Prayagraj during the summer season 2020-2021. The present investigation was comprised of 10 treatments of organic sources of nutrients. These treatments were sown in Randomized Complete Design with three replications.

Treatment details :

S. N.	Treatment symbol	Treatment details
1	T_0	RDF (Control)
2	T_1	Farm Yard Manure (F.Y.M) @20 tonnes ha^{-1}
3	T_2	Vermi compost (V.C) @ 1.2 tonnes ha^{-1}
4	T_3	Poultry manure (P.M) @ 1.2 tonnes ha^{-1}
5	T_4	F.Y.M @ 6t ha^{-1}+Azotobactor (Az) @ 700ml 10kg^{-1} Seed treatment
6	T_5	F.Y.M @ 6t ha-1+Phosphate Solubilizing Bacteria (P.S.B) @ 500ml 10kg^{-1} Seed treatment
7	T_6	V.C @ 0.6t ha-1+(Azo.) @ 700ml 10kg^{-1} Seed treatment
8	T_7	V.C @ 0.6t ha^{-1}+ P.S.B @ 500ml 10kg^{-1} Seed treatment
9	T_8	P.M @ 0.6t ha^{-1}+ Azo @ 700ml 10kg^{-1} Seed treatment
10	T_9	P.M @ 0.6t ha^{-1}+ P.S.B @ 500ml 10kg^{-1} Seed treatment

RESULTS AND DISCUSSION

1- Plant height (cm) :-

Plant height was recorded at harvesting stage (45 DAS). Perusal of data presented in table 1 revealed significant. Effect of different organic sources of nutrients and their combination on plant height of radish. The maximum average plant height at harvesting stage (39.50)cm was recorded with the application of vermi compost @ 0.6 tonnes ha^{-1} + Azotobacter @ 700 ml per 10 kg seed treatment, (T_6). Fallowed by (39.21) cm with the application of poultry manure@ 0.6 tonnes ha-1 + Azo. @ 700 ml per 10 kg seed treatment (T_8). Compare to other treatments. Respectively minimum average plant height (29.50) cm was recorded in RDF control plot (T_0). Fallowed by (37.35) cm, application of farm yard manure @ 20t ha^{-1} (T_1). The findings is also in agreement with the findings of Bhaktavathsalam and Geetha (2004), Zhou-Dongmei *et al.* (2005), Rani *et al.* (2006),

Table - 1 : Effect of organic sources of nutrients on plant height in radish.

Treatment symbol	Organic sources of nutrients	Plant height (cm)
T_0	RDF (Control)	29.50
T_1	Farm Yard Manure (F.Y.M) @ 20t ha^{-1}	37.35
T_2	Vermi compost (V.C) @ 12q ha^{-1}	37.00
T_3	Poultry manure (P.M) @ 12q ha^{-1}	37.27
T_4	F.Y.M@ 6t ha^{-1}+Azotobactor (Azo.) @ 700ml 10kg^{-1} seed treatment	38.02
T_5	F.Y.M@ 6t ha^{-1}+Phosphate Solubilizing Bacteria	
	(PSB) @ 500ml 10kg-1 seed treatment	37.65
T_6	V.C @ 6q ha^{-1}+ Azo. @ 700ml 10kg^{-1} seed treatment	39.50
T_7	V.C @ 6q ha^{-1}+PSB @ 500ml 10kg^{-1} seed treatment	39.03
T_8	P.M @ 6q ha^{-1}+ Azo. @ 700ml 10kg^{-1} seed treatment	39.21
T_9	P.M @ 6q ha^{-1}+PSB @ 500ml 10kg^{-1} seed treatment	37.50
	S.Ed.(±)	1.179
	C.D. (P = 0.05)	2.434

2. Number of leaves per plant :-

Number of leaves per plant was recorded at harvesting stage perusal of data presented in table 2 recorded significant effect of organic fertilizer and their combination on number of leaves of radish.The maximum average number of leaves per plant at harvesting (13.58) was recorded with the application of vermi compost @ 0.6 tonnes ha^{-1} + Azotobacter @ 700ml per 10 kg seed treatment, (T_6). Fallowed by (13.20) with the application of poultry manure@ 0.6 tonnes ha^{-1} + P.S.B culture @ 500ml per 10 kg seed treatment (T_9), compare to other treatments. Respectively minimum average number of leaves per plant (9.20) was recorded in RDF control plot (T0) followed by (10.50) with the application of F.Y.M @ 20t ha^{-1} (T_1). The findings are in agreement with the result of Dongmei *et al.* (2005), Vijaya kumari *et al.* (2009), Kumar *et al.* (2009), Kirad *et al.* (2010), Kanaujia *et al*. (2010), Uddain *et al*. (2010),

Table - 2 : Effect of organic sources of nutrients on number of leaves in radish.

Treatment symbol	Organic sources of nutrients	Number of leaves plant
T0	RDF (Control)	9.20
T1	Farm Yard Manure (F.Y.M) @ 20t ha-1	10.50
T2	Vermi compost (V.C) @ 12q ha-1	11.30
T3	Poultry manure (P.M) @ 12q ha-1	11.75
T4	F. Y.M@ 6t ha-1+Azotobactor (Azo.) @ 700ml 10kg-1 seed treatment	12.30
T5	F.Y.M@ 6t ha-1+Phosphate Solubilizing Bacteria (PSB) @ 500ml 10kg-1 seed treatment	12.20
T6	V.C @ 6q ha-1+ Azo. @ 700ml 10kg-1 seed treatment	13.58
T7	V.C @ 6q ha-1+PSB @ 500ml 10kg-1 seed treatment	12.60
T8	P.M @ 6q ha-1+ Azo. @ 700ml 10kg-1 seed treatment	12.75
T9	P.M @ 6q ha-1+PSB @ 500ml 10kg-1 seed treatment	13.20
	S.Ed (±)	0.840
	C.D. (P = 0.05)	1.734

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EFFECT OF NITROGEN, PHOSPHORUS AND POTASSIUM ON GROWTH, YIELD OF CARROT (DAUCUS CAROTA L.) VAR. NANTES

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ABSTRACT

Data regarding on effect of Nitrogen Phosphorus and Potassium on plant height and number of leaves of Carrot at harvest has been presented in Table - 1. Maximum plant height (46.67cm) is recorded in T_8 (Nitrogen 120 kg/ha+P2O_5 65kg/ha+K_2O175kg/ha)at harvest, which was found significantly higher over rest treatments. Maximum number of leaves (14.77) is recorded in T_9 (Nitrogen145kg/ha+P_2O_5 80kg/ha+K_2O 175 kg/ha) while the minimum (10.9) was recorded in T_0 under control. The data presented in Table - 2 explicit that root length and root diameter of Carrot at harvest. The maximum root length 20.55 cm was recorded with T_8 (Nitrogen120kg/ha+P_2O_5 65kg/ha+K_2O 175kg/ha) were as lowest was recorded (11.14 cm) in T_0 under control. The maximum diameter of root (7.35cm) was recorded with T_8 (Nitrogen120kg/ha+P_2O_5 65kg/ha+K_2O175kg/ha), which was significantly superior over other treatments. Lowest root diameter (4.87 cm) was recorded T_0 undercontrol.

Keywords *: Carrot , growth , yield, effect.*

INTRODUCTION

Carrot (*Daucus carota* L.) is a cool season crop belongs to division angiosperm, family Umbelliferae. Chromosome number is 2n=18. Genus *Daucus* and species *Carota* is well known as Gajar in local language. It is generally grown in all over the world in temperate during spring, summer and autumn, while in tropical and sub-tropical in winter. Carrot is said to be the native of North and South America. The first cultivated carrot types were purple or violet, yellow and later orange types were derived from this anthocyanin type by selection. The genus *Daucus* to which the carrot belongs which has about 50 species, some of are native to North America, though very few of them are cultivated

In carrot roots, sucrose is the most and abundant endogenous sugar as 10 times higher than glucose or fructose. Carrot roots are used for making soups, stews, curries, salad, pickles, jam and other kind of sweets beside this carrot leaves are said to be eaten in many countries. Its top can be used as a good source of extraction of leaf protein. Moreover, carrot tops are used as fodder and also for preparation of poultry feed. Root oil contains antibacterial property. Carrot increases the urine quantity and

helps in the elimination of uric acid. The carrot seed oil is used for flavoring liquor and all kinds of food substitutes, they are aromatic, stimulant and carminative. They are also useful in diseases of the kidney and in dropsy. Carrot requires a well fertile soil, which allows rapid, uninterrupted root growth. It thrives bestonadeep friableloamy soil but cannot be grown on highly acidic or alkaline soils or hard pan in sub soil. The optimum soil pH range for better development of roots is between 6 to 7

MATERIALS AND METHODS

A field experiment was conducted during rabi season 2020-21 to study the Effect of nitrogen, phosphorus and potassium on growth, yield of carrot (*Daucus carota* L.) var. Nantes. The experiment was laid out at the "College farm" Kulbhaskar Ashram Post Graduate Collage, Prayagraj, UP state. The data was statistically analysed as per Randomized Complete Block Design with 3 replication and number of treatments were 10.

Detail of Treatments :

T_0	**Control**
T_1	Nitrogen 120 kg/ha
T_2	Nitrogen 145 kg/ha
T_3	P_2O_5 65 kg/ha
T_4	P_2O_5 80 kg/ha
T_5	K_2O 150 kg /ha
T_6	K_2O 175 kg/ha
T_7	Nitrogen 120 kg/ha + P_2O_5 65 kg/ha + K_2O 150 kg//ha
T_8	Nitrogen 120 kg/ha + P_2O_5 65 kg/ha + K_2O 175 kg//ha
T_9	Nitrogen 145 kg/ha + P_2O_5 80 kg/ha + K_2O 175 kg//ha

RESULTS AND DISCUSSION

1. Plant height(cm) and Number of leaves at harvest.

Data regarding on effect of nitrogen phosphorus and potassium on plant height and number of leaves of Carrot at harvest has been presented in Table 1. Maximum plant height (46.67cm) is recorded in T_8(Nitrogen 120 kg/ha+P_2O_5 65kg/ha+K_2O 175kg/ha) at harvest, which was found significantly higher over rest treatments. Maximum number of leaves (14.77) was recorded in T_9(Nitrogen145kg/ha+P_2O_5 80kg/ha+K_2O 175 kg/ha) while the minimum (10.9) was recorded in T_0 under control.

Table - 1 : Effect of organic manures on Plant height and number of leaves of Beet root.

	Treatments	Plant height	Number of leaves At Harvested
T_0	Control	28.75	10.90
		36.75	12.45
T_1	Nitrogen 120 kg/ha	38.38	12.50
T_2	Nitrogen 145 kg/ha	38.39	11.90
T_3	P_2O_5 65 kg/ha	31.05	12.66
T_4	P_2O_5 80 kg/ha	38.97	13.35
T_5	K_2O 150 kg /ha	35.18	13.46
T_6	K_2O 175 kg/ha	40.70	14.50
T_7	Nitrogen 120 kg/ha + P_2O_5 65 kg/ha + K_2O 150 kg//ha	46.67	14.65
T_8	Nitrogen 120 kg/ha + P_2O_5 65 kg/ha + K_2O 175 kg//ha	46.54	14.77
T_9	Nitrogen 145 kg/ha + P_2O_5 80 kg/ha + K_2O 175 kg//ha	1.650	0.997
	F-test	3.405	2.058
	S. Ed.(±)		
	C. D. (P = 0.05)		

2. Root length and Root Diameter in (cm) at harvest.

The data presented in Table-2 explicit that root length and root diameter of carrot at harvest. The maximum root length 20.55cm was recorded with T_8 (Nitrogen120kg/ha+P_2O_5 65kg/ha+K_2O 175kg/ha) were as lowest was recorded (11.14 cm) in T_0 under control. The maximum diameter of root 7.35cm was recorded with T_8 (Nitrogen 120kg/ha+P_2O_5 65kg/ha+ K_2O175 kg/ha), which was significantly superior over other treatments. Lowest root diameter (4.87 cm) was recorded in T_0 under control.

Table - 2 : Effect of organic manures on Root length and root diameter of beet root.

	Treatments	Root length (cm)	Diameter of root (cm)
T_0	Control	11.14	4.87
T_1	Nitrogen 120 kg/ha	11.56	5.25
T_2	Nitrogen 145 kg/ha	11.65	5.50
T_3	P_2O_5 65 kg/ha	12.63	5.60
T_4	P_2O_5 80 kg/ha	10.53	4.97
T_5	K_2O 150 kg /ha	16.80	6.01
T_6	K_2O 175 kg/ha	19.58	5.12
T_7	Nitrogen 120 kg/ha + P_2O_5 65 kg/ha + K_2O 150 kg//ha	20.55	6.75
T_8	Nitrogen 120 kg/ha + P_2O_5 65 kg/ha + K_2O 175 kg//ha	19.67	7.35
T_9	Nitrogen 145 kg/ha + P_2O_5 80 kg/ha + K_2O 175 kg//ha	2.409	0.557
	F-test	1.167	0.270
	S. Ed.(±)		
	C. D. (P = 0.05)		

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TO EVALUATE THE PHYSICOCHEMICAL QUALITIES OF WHEY BEVERAGE USING ORANGE FLAVOR

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ABSTRACT

The experiment was conducted in the laboratory of Department of Animal Husbandry and Dairying. Chandra Shekhar Azad University of Agriculture and Technology, Kanpur -208002 (U.P.) India. In the experiment 5 level of orange flavour (0.10%, 0.15%, 0.20%, 0.25%, 0.30%) where taken with the 5 level of sugar (8%, 9%, 10%, 11%, 12%) and replicated 3 times. The effects of various attributes on quality of orange flavour based whey drink where analyzed and determine for physical quality like flavour, colour and appearance, sweetness, overall acceptability, and chemical quality like moisture, fat, protein, lactose, sucrose and ash per cent were determine. The overall maximum protein contents were recorded in case of samples prepared from 0.20% orange flavour, and 10% sugar . Highest fat content was noted in case of samples prepared by 0.20% orange flavour and 10% sugar . The overall maximum flavour score were recorded in case sample prepared from 0.20% orange flavour, with 10% level of sugar The whey beverage was prepared by using orange flavour, 0.10%, 0.15%, 0.20%, 0.25%, 0.30% and sugar with 8%, 9%, 10%, 11%, and 12%. The superior sensory quality of orange flavour based whey beverage obtained when samples prepared with 0.20% orange flavour and 10% sugar, with 0-day storage.

Keywords : *Evaluate , chemical, whey beverage, orange , flavor, physical and qualities.*

INTRODUCTION

WHEY-Whey is the largest by-product of dairy industries obtaining during manufacture of casein, cheese, paneer, chhana etc. Whey had been considered as the milk by-product. It has been dumped into land, sewage, water ways and oceans while partly use as animal feed. Global production of liquid whey from cheese and casein amounted to 190 MT in 2020-2021 and annual average growth 3-4%. In India, it was estimated that about 100 million kg of whey is annually derived as a by-product which may cause substantial loss of about 70,000 tones of nutritious whey solids.

Whey protein are of two types major proteins and minor proteins, major whey proteins are β-lactoglobulin-65%, α-lactalbumin-25%,

serum albumin-8% and minor proteins/peptides are Glycomacropeptide (GMP), bovine serum albumin, lactoferrin, Immunoglobulin, phosphor-lipoproteins. Whey proteins have a biological value of 110, which is higher than the value for casein, soy protein, beef, or wheat gluten and have a high content of sulfur containing amino acids such as cysteine and methionine. Various filtration techniques, such as prefiltration and ultra-filtration were used, and orange, mango and pineapple juices were added with a view to making them more nutritious and acceptable organoleptically. Carbonation remarkably improved the sensory characteristics of the beverages, which were found to be more acceptable than the market samples by Sheikh *et al.* (2009).

For an average person, the daily dietary intake of protein is 0.8 g per kilogram of body weight. Studies done by Anita *et al.* show that resistance training and endurance athletes do have a higher protein requirement. This experimentation was carried out by feeding athletes different amounts of protein and calculating their nitrogen balance by Kanchana *et . al*

MATERIALS AND METHODS

The experiment was conducted in the laboratory of Department of Animal Husbandry and Dairying. Chandra Shekhar Azad University of Agriculture and Technology, Kanpur - 208002 (U.P.) India. In the experiment 5 level of orange flavor (0.10%, 0.15%, 0.20%, 0.25%, 0.30%) where taken with the 5 level of sugar (8%, 9%, 10%, 11%, 12%) and replicated 3 times.

The sample was analysed or their fat content by Gerber's method as recommended by I. S. (Part II-1977) O ml of sulphuric acid (Sp. Gravity1.825) was taken in the clean and dry butyrometer, and to this was added 10. 75 ml sample (which was measured by 10. 75 ml pipette) and then add 1. 0 ml of amyl alcohol (Sp. Gravity 0. 825) then Rubber lock stopper was inserted after drying the neck with the help of chalk. The butyrometer was shaken until the content mixed well. Now butyrometer were placed in an electric centrifuge and rotated for 4 to 5 minutes at a speed of 1000-1400 rpm. The centrifuge was stopped and butyrometer were transferred to water both maintained at 70oC. After 5 minutes the reading was noted on graduated stem of the butyrometer.

Since nitrogen becomes an important constituent in all living organisms. Estimation of some becomes a significant analysis in chemistry. The chemistries have been developed to estimate. Nitrogen in soil fertilizer, explosive etc., Kjeldahl method is proved to be a meet accepted throughout the world. Protein content of whey drink was determined according to the recommended by ISI (1961) for the determination of milk protein. Kjeldahl method is developed to estimate nitrogen which consists of the three processes.

1. Digestion
2. Distillation
3. Titration

The sucrose content of whey beverage using orange flavour was determined as per the method mentioned 10 gm. of sample was taken in a clean 100 ml. measuring flask to it add warm water, 2 ml. each of 10 per cent, Acetic Acid 20 per cent, Ammonium Acetate was added to calculate the proteins. Flask was rotated to get on big clot of coagulated material than the volume was made to 100 ml. with cold distilled water. It was than filtered through a dry filter paper. The filtrate was collected for total carbohydrate estimation.

Take 5 ml. each of Fahling solution A and B into a conical flask and 40 ml. of distilled water was added to it. The filtrate was filled into a burette the content flask was heated to boiling and continued gentle boiling now the total carbohydrate. Solution (filtrate) was added drop by drop till brick red

precipitate was formed. At this stage 3-5 drops of methylene blue indicator was carried on colonial flask. The titration was carried on till blue colour. Colour was completely reduced and brick red colour reappeared. The per cent of sucrose content was the calculated with the help of reducing formula.

RESULTS AND DISCUSSION

The comparison of orange flavour-based whey beverage at different levels has been given in Table-1 From Table 4. 1. 1, the effect of flavour & sugar level, it is observed the maximum score (8.367) in F3S3 sample and minimum score (7.167) in F5S5 sample. The effect of different treatment combinations on colour and appearance of orange flavour based whey beverage has been presented in the table 2. From Table 2, the means of different levels of all the factors for colour and appearance score of orange flavour-based whey beverage, the following facts were observed. The maximum colour and appearance score of orange flavourbased whey beverage (8.433) was noted in sample F3S3 while minimum score (7.233) in F1S1 sample are similar observation is by Divya and Archana (2009) work on Studied the effect of different temperatures. Timings and storage periods on the physico - chemical and nutritional characteristics of whey-guava beverage.

The effect of different treatment combinations on sweetness of orange flavour based whey beverage has been presented in the Table 3.

Table -1: Effect of various orange flavour and sugar levels on flavour of orange flavoured-based whey beverage.

Treatment	F1	F2	F3	F4	F5	Mean F
S1	7.533	8.000	8.133	7.400	7.333	7.680
S2	7.900	8.200	8.233	7.933	7.633	7.980
S3	8.067	8.267	**8.367**	8.167	7.833	8.140
S4	7.733	7.967	8.267	7.533	7.467	7.793
S5	7.367	7.533	7.833	7.400	**7.167**	7.460
Mean S	7.720	7.993	8.167	7.687	7.487	

Table -2: Effect of various orange flavour and sugar levels on colour and appearance of orange flavoured-based whey beverage.

Treatment	F1	F2	F3	F4	F5	Mean
S1	**7.233**	7.800	8.133	7.900	7.533	7.720
S2	7.733	8.067	8.200	8.167	7.733	7.980
S3	8.133	8.233	**8.433**	8.200	7.867	8.173
S4	7.533	8.133	8.000	7.900	7.467	7.807
S5	7.367	7.733	7.833	7.567	7.267	7.553
Mean	7.600	7.933	8.120	7.947	7.573	

Table -3: Effect of various orange flavour and sugar levels on sweetness of orange flavoured-based whey beverage.

Treatment	F1	F2	F3	F4	F5	Mean
S1	7.833	8.000	8.200	7.900	**7.200**	7.827
S2	7.900	8.200	8.300	8.000	7.533	7.987
S3	8.133	8.333	**8.467**	8.200	7.900	8.207
S4	7.633	8.133	8.300	7.833	7.467	7.873
S5	7.300	7.667	7.967	7.533	7.233	7.540
Mean	7.760	8.067	8.247	7.893	7.467	

Table -1: Effect of various orange flavour and sugar levels on fat per cent of orange flavoured-based whey beverage.

Treatment	F1	F2	F3	F4	F5	Mean
S1	**0.600**	0.453	0.450	0.430	0.427	0.472
S2	0.463	0.470	0.427	0.430	0.437	0.445
S3	0.447	0.430	0.440	0.437	**0.380**	0.427
S4	0.440	0.427	0.423	0.430	0.410	0.426
S5	0.450	0.443	0.430	0.427	0.410	0.432
Mean	0.480	0.445	0.434	0.431	0.413	

Table -2: Effect of various orange flavour and sugar levels on protein per cent of orange flavoured-based whey beverage.

Treatment	F1	F2	F3	F4	F5	Mean
S1	0.394	0.384	0.377	0.369	**0.368**	0.378
S2	0.395	0.387	0.399	0.398	0.395	0.395
S3	0.394	0.396	0.399	**0.402**	0.401	0.398
S4	0.387	0.384	0.394	0.390	0.385	0.388
S5	0.392	0.398	0.390	0.397	0.394	0.394
Mean	0.392	0.390	0.392	0.391	0.389	

Table - 4. 9. 1: Effect of various orange flavour and sugar levels on sucrose per cent of orange flavoured-based whey beverage.

Treatment	F1	F2	F3	F4	F5	Mean
S1	10.433	11.267	13.333	14.267	15.200	12.900
S2	**10.267**	10.300	13.267	14.333	15.533	12.740
S3	10.333	11.600	12.967	14.600	15.433	12.987
S4	10.500	11.600	12.800	14.600	15.733	13.047
S5	11.600	12.733	13.433	14.733	**15.967**	13.693
Mean	10.627	11.500	13.160	14.507	15.573	

From Table 3, the means of different levels of all the factors for sweetness score of orange flavour based whey beverage, the following facts were observed. The maximum sweetness score of orange flavour based whey beverage (8.467) was noted in sample F3S3 while minimum score (7.200) in F5S1 sample similar observation is by Naik *et al. (*2009) work on physico- chemical and sensory characteristics of whey-based watermelon beverage.

The Fat per cent in the sample of orange flavour basedwhey beverage observed in the laboratory. The detailed results are given in table 1. From Table 1, the means of different levels of all the factors for fat score of orange flavour based whey beverage, the following facts were observed. The fat score of orange flavour-based whey beverage maximum (0.600%) was noted in sample F1S1 while minimum score (0.380%) in F5S3 sample is similar observation was recorded by Idan *et al.* (2021) work on study was conducted to develop Grape-Flavored.

The Protein per cent in the sample of orange flavour-based whey beverage observed in the laboratory. The detailed results are given in table 2. From Table 2, the means of different levels of all the factors for protein score of orange flavour-based whey beverage, the following facts were observed. The maximum protein score of orange flavour-based whey beverage. (0.402%) was noted in sample F4S3 while minimum score (0.368%) in F5S1 sample was similar observation recorded by Singh *et al.* (2014) work on utilization of guava pulp in the development of whey based beverage.

The Total sucrose per cent in the sample of orange flavour based whey beverage observed in the laboratory. The detailed results are given in table 3. From Table 3, the means of different levels of all the factors for sucrose score of orange flavour-based whey beverage, the following facts were observed. The maximum sucrose score of orange flavour-based whey beverage maximum. (15.967%) was noted in sample F5S5 while minimum score (10.267%) in F1S2 sample . It means increase the sugar in beverage reduced the sucrose content and increase the lactose was similar observation recorded by Revathi *et al*. (2014) work on pineapple flavored paneer whey beverage was prepared with the addition of different level of whey, sugar and

pineapple flavor.

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EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH OF RADISH [RAPHANUS SATIVUS L] CV. "JAPANESE WHITE"

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ABSTRACT

Data regarding on effect of integrated nutrient management on plant height of Radish at various stage and their average has been presented in Table 1. maximum average plant height at harvesting (32.53 cm) was recorded with the application of FYM (T1), followed by (32.04 cm) NPK liquid consortia Liquid (Biofertilizer, T3) compared to other treatment. Minimum average plant height (29.16cm) was recorded in control plot (T0). The data presented in Table 2. explicit that average number of leaves of Radish at various growth stages. The maximum average number of leaves per plant at harvesting stage (9.17) was recorded with the application of FYM (T1) followed by (9.05) NPK liquid consortia (T3) compared to other treatments.

Keywords : *Radish, japanese white, FYM , biofertilizers, and plant height*

INTRODUCTION

Radish *(Raphanus sativus L.)* is a popular root vegetable in both tropical and temperate regions of Cruciferae (Brassicaceae) family grown all over world. In India, it is widely cultivated in northern and southern plains as well as in hills. Radish (2n=18) is grown for its young tender fusiform root which is consumed either raw as salad or cooked as a vegetable. Being a cool season crop, it is sown during winter from september to january in northern plains. It is an annual or biennial herb depending on types. The leaves are varying from 10-15 cm in small-rooted cultivars to as much as 45 cm long rooted cultivars. Radish roots are varying greatly in size, shape and other external characters. The inflorescence of radish is typical terminal raceme of cruciferae. The flower of radish is small white, rose or iliac in colour with purple veins in bractless raceme. Pods are 3-7 cm long and up to 1.5-2.0 cm in diameter with 5-12 seeds and long conical beak. Inorganic manures increases the yield but deteriorate the quality of produce. The integrated nutrient management system approach, utilizes a judicious combination of inorganic fertilizer and organic manure build soil fertility and to increase the production of crop (Kumar et *al.* 2013).

MATERIALS AND METHODS

Field experiment entitled "Effect of

Integrated Nutrient Management on growth of Radish (*Raphanus Sativus* L.)cv. Japanese white" was conducted at the Horticulture Farm K.A.P.G. Allahabad Utter Pradesh during rabi season 2020-21. The details of the procedure adopted for Crop raising and criteria used for treatment evaluation during entire course of investigation are described in this chapter. The *experiment* consists of 8 treatments combinations comprising of organic manures with and without biofertilizer (viz. NPK liquid consortia Bio). The present investigation was comprised of 8 treatments of organics and biofertilizer. The treatments were sown in Randomized Block Design (R.B.D.) with three replications. The details are as below.

Details of treatments used in study

S. NO.	Treatment symbol	Treatment detail
1.	T0	Control unit (RDF) Reccomend dose of fertilizer
2.	T1	FYM@10t/ha
3	T2	Vermicompost @4t/ha
4.	T3	NPK Liquid consortium (Biofertilizer) @ 100ml/10kg seed treatment.
5.	T4	(5 tonnes FYM+ 2 tonnes Vermicompost)/ha.
6.	T5	5 tonnes FYM/ha+ 50ml NPK liquid consortium (Bio fertilizer)/10 kg seed treat
7.	T6	2 tonnes Vermicompost/ha+ 50ml NPK Liquid consortium (Bio fertilizer)/10 kg seed treat.
8.	T7	3.3 tonnes FYM/ha+ 1.33 tonnes vermicompost/ha +33.33ml NPK liquid consortium/10 kg seed treat.

RESULTS AND DISCUSSION

1. Plant height (cm):

Plant height was recorded at harvesting stage. Perusal of data presented in Table 1 revealed significant effect of Bio fertilizer, organic manure and their combination on plant height of radish. The maximum average plant height at harvesting (32.53 cm) was recorded with the application of FYM (T1), followed by (32.4cm) NPK liquid consortia Liquid (Biofertilizer, T3) compared to other treatment.Minimum average plant height (29.16 cm) was recorded in control plot (T0), while (30.91cm) FYM + Vermicompost + NPK liquid consortium (T7) The findings are also agreements with the findings Patil *et al*. (2007) and Ngullie *et al* (2009) in onion, Pillai *et al.* (1985).

Table - 1 : Effect of INM (organic, biofertilizer and their combination) on plant height of radish

Treatments Symbol	Treatments Details	Plant height(cm)
T0	Control unit (RDF)	29.16
T1	FYM @10t/ha	32.53
T2	Vermicompost@4t/ha	31.83
T3	NPK Liquid consortium (Biofertilizer) @ 100ml/10kg seed treatment.	32.04
T4	(5 tones FYM+ 2 tonnes Vermicompost)/ha.	31.16
T5	5 tonnes FYM/ha+ 50ml NPK liquid consortium (Bio fertilizer)/10 kg seed treat	316
T6	2 tonnes Vermicompost/ha+ 50ml NPK Liquid consortium (Bio fertilizer)/10 kg seed treat.	31
T7	3.3 tones FYM/ha+ 1.33 tonnes vermicompost/ha +33.33ml NPK liquid consortium/10 kg seed treat.	30.91
	SEm±	**1.731**
	C.D.at 5% Level	**5.252**

2. Number of leaves per plant:

Number of leaves per plant was recorded at harvesting stage. Perusal of data presented in Table 2 revealed significant effect of biofertilizer, organic manures and their combination on number of leaves per plant in radish. The maximum average number of leaves per plant at harvesting stage (9.17) was recorded with the application of FYM (T1) followed by (9.05) NPK liquid consortia (T3) compared to other treatments. Respectively, minimum average number of leaves per plant (7.75) was recorded in control plot (T0) followed by (8.51), FYM + Vermicompost + NPK liquid consortia (T7). The

findings are also agreements with the findings Meelu (1996), Singh *et al.* (2009), Patidar and Mali (2004).

Table - 2 : Effect of INM (biofertilizer, organic manures and their combination) on number of leaves per plant in radish.

Treatment symbol	Treatments Details	Level/plant
T0	Control unit (RDF)	7.75
T1	FTM@10t/ha	9.17
T2	Vermicompost@4t/ha	8.88
T3	NPK Liquid consortium (Biofertilizer) @ 100ml/10kg seed treatment.	9.05
T4	(5 tonnes FYM+ 2 tonnes Vermicompost)/ha.	8.55
T5	5 tonnes FYM/ha+ 50ml NPK liquid consortium (Bio fertilizer)/10 kg seed treat.	8.85
T 6	2 tonnes Vermicompost/ha+ 50ml NPK Liquid consortium (Bio fertilizer)/ 10 kg seed treat.	8.55
T7	3.3 tonnes FYM/ha+ 1.33 tonnes vermicompost/ha +33.33ml NPK liquid consortium/10 kg seed treat.	8.51
	SEm±	**0.435**
	C.D.at 5% level	**1.322**

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EFFECT OF FEED SUPPLEMENT ON MILK PRODUCTION AND COST- BENEFIT RATIO IN CATTLE

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ABSTRACT

The present experiment conducted at dairy farm during 2017 - 18 C.S. Azad university of agriculture and technology Kanpur. To study about the effect of feed supplement on milk production and the cost- benefit ratio of cattle .Twelve Sahiwal cows were selected study on milk production and cost- benefit ratio and four cows in each group T_1 was served as (control) groups whereas T_2 and T_3 groups (treatment) were provided 50 and 75 gm feed supplement, respectivelly. The animals of all the groups were fed according to ICAR feeding standard. Water was provided ad –lib twice daily A balance feed is one which supplied the feed supplement necessary to nourish the animal Properly during twenty four hour period it depends upon the kind of animal and the purpose for which animal and is kept with a balanced mineral the animal can get the best out of all the constituent present in their food. If cows are not fed properly they show poor milk production. The feed supplement is more purposeful and beneficial. Proper feed supplement is the basis of successful dairy operation, since feed supplement cost accounts for over half of the total cost of milk Production. For more performance a balance feed is essential. The average weekly milk production lit/week were recorded 41.30 $\pm$ 0.192, 44.50 $\pm$ 0.118 and 48.49 $\pm$ 0.333 in T_1, T_2 and T_3 respectively. The higher milk productions were recorded in T_3 groups among the other of sahiwal cows. From the present study it can be conclude that so gm and 75 gm feed supplement fed to milch sahiwal cows as recommended by manufacturer can be feed supplement for obtaining optimum increase in milk production in sahiwal cows.

Keywords : *Dairy cows, feed supplement, milk production.*

INTRODUCTION

India is a developing country and more than 70% of the human population still depends upon agriculture and livestock sector for their livelihood .The population of livestock in world is 3809.7 million and the most of the animals are kept on grazing based production system (FAOSTAT. 2012)*. Presently, India is bestowed with a huge livestock population (512.05 million) in which comprising of 190.90 million cattle,180.70 million buffaloes,135.17 million goat, .65.06 million sheep and 729.20 million poultry as per livestock census

(GOI 2012)*.The Utter Pradesh state of consist of Cattle 19.33 million ,Buffalo 30.62 million and total livestock population in U.P. 68.75 million. Demand for energy is very high during early stage of lactation but supply does not commensurate with demand thus affecting the production potential of animal (Sirohi *et al.*, 2010). Hence, during early lactation, dairy animals are often forced to draw on body reserves to satisfy energy requirements thereby leading to substantial loss in body weight which adversely affects production, resulting in lower yield (Kim *et al.*, 1993). Cereal grains and fats play an important role as sources of energy in the ration of dairy animals but due to use of cereals for human consumption and mono gastric animals the alternate source of energy in dairy ration is supplemental fat (Saijpaul *et al.*, 2010). A balanced ration is supplies of all the necessary nutrients to nourish the animal properly during twenty four hour period. It depends upon the kind of animal and the purpose for animal kept, with a balanced ration the animal can get the best out of all the constituents present in their food. The proper feeding is the basis of successful dairy operations, since feed cost accounts for over half of the cost of milk production. For optimum performance, a balance ration is aims. The present work was under taken to study the effect of feed supplement on milk yield and cost –benefit ratio of cattle.

MATERIALS AND METHODS

Selection of the Sahiwal Cows : A total of twelve sahiwal cows varying between one and five lactations and of nearly similar stage of lactations were selected from the herd maintained at the dairy farm. All the twelve sahiwal cows were divided in to three groups to maintain the similarly in the trial. The particularly group of the cows used in the study and feeding pattern were adopted as under. The milk yield of such cows was recorded separately for each schedule.

Feeding Management : The Sahiwal cows T1 (control groups) were fed according to ICAR feeding Standards (1985) and calculate the amount of D.M; D.C.P, TDN on the body weight basis. The group T_1 were used as a control, the group T_2 (treatment groups) were fed berseem 25 kg forage with ad-lib wheat straw to avoid bloat condition in and cattle 50 gm feed supplement (dugdh ganga) per animal per day and the group T_3 (treatment groups) were fed wheat straw + concentrate and 75gm feed supplement per animal per day. The feeding trial was conducted for 120 days duration.

Table - 1 : Twelve select of sahiwal cows.

S. No.	Ear Tag No.	Name of sahiwal cows	Lactation	Date of Calving	Milk yield Lit/Day	Intial body weight	Allotment of treatment
1.	73	Kabila	2	2/12/17	5.5	370	T_1
2.	118	Basanti	2	17/2/18	2	390	T_1
3.	60	Sarita	2	28/1/18	6.0	372	T_1
4.	109	Kavita	3	25/1/18	8.0	370	T_1
5.	45	Moli	2	14/9/17	6.0	377	T_2
6.	104	Komal	2	14/11/17	5.0	370	T_2
7.	108	Kashi	1	12/12/17	4.0	372	T_2
8.	88	Kasturi	1	28/10/17	3.0	375	T_2
9.	12	Shami	3	15/9/17	3.0	370	T_3
10	66	Seema	2	20/8/17	3.0	375	T_3
11	35	Kakan	2	23/12/17	5.0	380	T_3
12	99	Bakki	1	14/2/18	2.0	377	T_3

Table - 2 : Chemical composition of different ingredients fed to Animal (% on D.M. Basis).

S. No.	Feed Offered	D.M. %	CP %	EE %	CF %	NEE %	Total Ash %
1.	Wheat Straw	90.00	3.00	1.00	38.00	46.00	12.00
2.	Green Berseem	20.00	17.50	2.25	24.00	46.00	10.25
3.	Concentrate Mixture	90.00	20.00	1.80	15.80	51.10	11.50
4.	Dugdh Ganga	Ca 18.0%	P 21.0%	-	-	-	-
5.	Wheat bran	90.80	11.50	2.90	12.70	60.50	10.40
6.	Barley	89.50	9.50	1.50	5.50	78.00	5.50
7.	Mustard cake	90.00	36.00	11.00	10.00	33.00	10.00

Table - 3 : Average milk production of sahiwal cows in different groups of animal (liters/week).

Week treatment	T_1 (control group)	Experimental group (Milk production in Lit)		Mean (Lit)
		T_2	T_3	
W1	40.78	44.10	47.98	44.28
W2	39.00	40.98	47.99	42.65
W3	41.10	44.99	48.10	44.69
W4	41.21	45.00	48.00	44.77
W5	42.00	45.10	48.75	45.28
W6	42.21	45.25	49.00	45.48
W7	42.07	45.45	49.10	45.54
W8	42.10	45.20	49.07	45.45
Mean	41.30	44.50	48.49	
S.E.	0.192	0.118	0.333	

Table - 4 : Feed cost experimental in Sahiwal cows is presented in Table4

Particulars	Group T_1		Group T_2		Group T_3	
	Feed offered (kg)	Feed cost (Rs.)	Feed offered (kg)	Feed cost (Rs.)	Feed offered (kg)	Feed cost (Rs.)
Wheat straw (90%D.M.) @Rs 2.50/kg	270	675	300	750	320	800
Concentrate mixture (90%D.M.)@rs12. 00./kg	120	1440	120	1440	120	1440
Dugdh Ganga @ rs. 175/kg	-	-	4	700	6	1050
Berseem(20%D.M.) @ rs. 3.00/kg	600	1800	600	1800	600	1800
Total		**3915.00**		**4690.00**		**5090.00**

RESULTS AND DISCUSSION

Milk production: - Average milk production performance of experimental cows is given in Table - 3 :

At the beginning of the experiment, milk production level of experimental sahiwal cows was almost similar. By the end of research (60 days) milk production level of T3 increased significantly ($P<0.005$) and reached 48.49±0.333 in week comparison to other two groups 41.30±0.192 and 44.50±0.118 Lit/week for T1 and T2, respectively. The higher milk production in T3 group than other groups while with difference were significant along with the groups. From the present study it can be conclude that the feed supplement recommended can be given for obtaining optimum milk production in sahiwal cows.The experiment proved that feed supplement was found to be more effective.

Feed cost of 60 days feeding among the experimental groups of lactating Sahiwal cows has been given in (Table 18) .Feed cost of 60 days feeding were 3915.00, 4690.00 and 5090.00 in groups T1 , T2 and T3 respectively . Net income of feed cost is given in following.

Economic analysis: Cost benefit analysis of the experiment is presented in Table 5.

Table - 5 : Cost benefit analysis

S.N.	Parameter	Treatment groups		
		T_1	T_2	T_3
1.	Total milk production/ animal for 60 days (liter)	413.09	445.09	484.99
2.	Milk cost (Rs)	30	30	30
3.	Income (Rs)	12,392.7	13,352.7	14,549.7
4.	Fed cost (Rs)	3915.oo	4690.00	5090.00
5.	Net Income (Rs)	8477.7	8662.7	9779.00
6.	Net average income for/day/group	8477.7/60 =141.29	8662.7 /60 =144.37	9779.00/60 =157.66
7.	Comparison Net income for one day	$T_2 - T_1$ =144.37-141.29 =3.08	$T_3 - T_1$ =157.66-144.37 =12.79	

The total milk production per animal during 60 days of the experiment was 413.0 L, 445.09 L and 484.99 L for T1, T2 and T3, respectively. The milk selling rate of the local market was 30/L. Income from the selling of milk was calculated based on the selling rate of the local market which accounted for12392.7, 13,352.7 and14, 549.7 for T1, T2 and T3, respectively. Feed supplement and the straw cost was taken from the market whereas green grass cost was not accounted because of grazing and cultivated in the land of NCRP. One labor was hired for 12 lactating cows milking, feeding, grazing and others. Therefore, the total feed cost of production was accumulated 3915.00, 4690.00 and 5090.00 for T1, T2 and T3, respectively. Net income was calculated by deduction of the total cost from income of milk selling. The highest net income was noted in T3 (9779.00) followed by T1 (8477.7) and T2 (8662.7).

Milk production: - This study was carried out to evaluate the effects of feed supplement in feeding on milk production performance in lactating sahiwal cows. The present study revealed that feed supplementation of the diet significantly ($P<0.005$).Overall milk production of lactating sahiwal cows due to feed supplement and milk was recorded in week. The milk production

41.30±0.192, 44.50±0.118 and 48.49±0.333 lit/week in per cent in T1. T2 and T3 Group respectively, group T3 was highly significant as compared to other groups. There was significant ($P<0.05$) improvement in milk production due to feeding of feed supplement. This finding is in agreement with the Garg *et. al.* (2003) and Yadav *et .al.* (2012). Also, it was suggested that the improved milk production may be due to the supply of required amino acids and metabolisable energy to the host animal at a cellular level (Bugalia and Chaudhary, 2010). Faldet and Satter (1995) conducted an experiment on lactating cows during week 1 and 2 postpartum by feeding heat-treated soybean cake. In their experiment, they noted that feeding heat-treated soybeans supported more milk (4.5 L/d), 3.5% FCM (4.0 L/d), and milk protein (0.09 kg/d) than soybean meal or raw soybeans. Reported that the average milk yield was significantly improved in lactating crossbred cows fed with heat treated sesame cake in place of untreated sesame cake in the concentrate mixture. Sampath *et al*. (1997) also found an increase in FCM in crossbred cows supplemented. Economic analysis of the experiment showed that supplementation of additional protein source is beneficial in late lactation in some extent (Table 5). The highest net income was noted in T3 (9779.00) followed by T1 (8477.7) and T2 (8662.7). It might be due to the early lactation period of experimental cows. Moreover, the experiment also proved that feed supplement taken lactating sahiwal cow's treatment is more effective than control treatment.

CONCLUSION

The findings of the study revealed that feed supplement taken lactating sahiwal cows in improving milk production. Therefore, it is suggested that under those circumstances where cows' basal diet mainly comprises from straw, and berseem which are poor in nutritive value then additional feed supplementation of high milk production in early lactation period (up to 3 months) could be one of the option to increase milk production of high yielding cows rather than mid and late period of lactation.

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INTEGRATED FARMING SYSTEM : A PROMISE TO SUSTAINABLE AGRICULTURE

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ABSTRACT

India is an agrarian nation with 65.97 percent population belongs to rural area. The majority of the peasants in India are small and marginal, possessing less than two hectares of land. Integrated Farming System (IFS) witnessed fast development in the recent two decades when harvest and animal yields expanded, together with the worries about their financial and biophysical tradeoffs. It is basic to create procedures that empower satisfactory pay and business age, particularly for little and minimal ranchers who comprise more than 85 % of the cultivating community. Therefore, Integrated Farming frameworks can be demonstrated as reasonable methodology speaks to a suitable blend of homestead undertakings, viz. crop creation, agriculture, domestic animals, fishery, ranger service, poultry and goat in an explicit cultivating circumstance to address the issues of practical financial development of Indian cultivating communities. An integrated Farming system appears to be the conceivable answer for the nonstop increment of interest for nourishment and sustenance, salary solidness, and job upliftment, especially for little ranchers with limited resources.

Keywords: *Integrated farming system, livestock, crop, apiculture, sericulture, sustainability.*

INTRODUCTION

Farming has consistently been considered the inspiration of our nation. In India, 70 you look after the agricultural populace is occupied with horticulture and 80% of the populace live, legitimately or during a detour on salary conveyed from agribusiness. There are 115 million operational possessions within the nation and around 80 you're peripheral and small ranchers (Manjunatha*et al.,* 2014). To satisfy the elemental needs of the household including nourishment (oat, beats, oilseeds, milk, organic product, nectar, meat, so forth.), feed, grub, fiber, and then forth warrant a consideration about Integrated Farming System. Without a doubt, the larger a part of the ranchers is doing cultivating for a protracted back yet their

principal centre was singular segments however not in a very coordinated way. Integrated cultivating framework approach is not only a solid method for acquiring genuinely high profitability with significant extension for asset reusing, yet additionally idea of biological adequacy prompting maintainable farming. one in every of the alternatives to assess the potential of sufficiently old blended cultivating now as an IFS in improving salary of homestead families inside the sensible time span. Abnormal conduct of storm, precipitation, dissolved and corrupted soils with different supplement and water insufficiencies, declining groundwater table and poor asset base of the ranchers are rule imperatives for low and temperamental yields in rainfed zones (Singh*et al.,*2004). Sugarcane – wheat is that the major editing framework, covering around 30 percent zone in western Uttar Pradesh. Other cultivating exercises may contain anyone or blend of mono or different editing; green harvests, agro forestry, animal poultry, fishery, goat/sheep rearing, and so on. Within the current examination, asset profitability of yield and non-crop endeavours in various cultivating frameworks has been broke down and requirements for more significant yields in proposals cultivating frameworks are distinguished.It is, during this way, basic that ranchers should embrace distinctive farming systems or auxiliary ventures like dairying, poultry, goat keeping, etc. alongside crop creation for the age of pay consistently. These auxiliary occupations can possibly give normal and consistent independent work opportunities consistently.

Integrated Farming System as a mixed animal crop system where the animal component is commonly raised on agricultural waste products while the animal is employed to cultivate the soil and supply manure to be used as fertilizer and fuel (Jayanthi *et al.,* 2000).The Integrated Farming System model consists of field crops (Rice, groundnut, maize, pigeon, pea and ragi), horticultural crops (Yam, banana, tapioca and vegetables), vermin-composting and poultry (Vanaraja breed) in Gajapati district of Orissa (Mohanty *et al.,* 2010).In hilly region, the participation by male farmers were vital that they had 84.38, 96.88, 96.88 per cent participation in purchasing of finger lings, applying manure of fertilizers and marketing of the fish respectively (Pampi Paul *et al.,* 2015).These four ecosystems processes function together, complementing one another as sustainable agriculture requires system approach (Singh *et al.,* 2009). About 75% of the adversely affected households belong to rural communities of developing economies whose livelihood is directly or indirectly smitten by agriculture and allied activities (FAO 2009).Therefore IFS may be a multidisciplinary whole farm approach and extremely effective in solving the issues of small and marginal farmers. The approach aims at increasing income and employment from small-holding by integrating various farm enterprises and recycling crop residues and by products within the farm itself (Rajju Priya Soni*et al.*, 2014).

What is Integrated Farming System (IFS)

Integrated Farming System is a part of farming systems research (FSR), presents an adjustment in cultivating procedures for the most extreme creation is a trimming example and deal with the ideal use of assets. The homestead base is better reusing for beneficial purposes in the incorporated cultivating framework. In contrast to the specialized farming system incorporated cultivating frameworks, the action is engaged cycle a couple of chosen, reliant, between related and regularly between connecting creation frameworks dependent on hardly any yields, creatures, and related auxiliary callings. Coordinated farming

systems research includes the usage of essential produces optional produce of one framework as a fundamental contribution of another framework, along these lines making the commonly incorporated as one entire unit. There is a need for powerful linkages and complementarities of different segments to create an all-encompassing cultivating framework.

Edwards (1997) barely characterized the framework as an aquaculture framework that is incorporated with domesticated animals where new creature squanders is utilized to take care of fish. Okigbo (1995) characterized these frameworks as a blended cultivating framework that comprises of at least two discrete yet intelligently related pieces of a yield and domesticated animals undertakings. Jayanthi *et al.*(2000) portrayed these frameworks as a blended creature crop framework where the creature segment is frequently raised on rural waste items while the creature is utilized to develop the dirt and give compost to be utilized as manure and fuel. Agbonlabor *et al.*(2003) concentrated in Nigeria characterized the IFS idea as a sort of blended cultivating framework that consolidates yield and domesticated animal ventures in a strengthening and additionally correlative way. The distinction between blended cultivating and incorporated cultivating is that endeavors in the coordinated cultivating framework are commonly steady and rely upon one another (Csavas, 1992).

Radhammani *et al.* (2003) portrayed IFS as ideas of limiting danger, expanding creation and benefits alongside improving the use of natural squanders and harvest deposits. Obviously, there are cooperative energies and supplements between the big business that included a yield and creature segment to frame the premise of the IFS idea. In this regard, reconciliation for the most part happens when yields (generally results) of one undertaking are utilized as contributions for another inside the setting of the farming system. Mangala (2008) uncovered that the coordinated cultivating rehearses embraced by respondents after usage of Integrated Farming System Program in Dharwad were agribusiness cultivation ranger service dairy vermicompost (62.14%), agribusiness horticulture forestry-dairy-vermicompost-search crops (21.43%), horticulture cultivation dairy-rummage crops (7.86%), horticulture agriculture ranger service dairy-scavenge crops (5.00%) and farming agriculture dairy (3.57%). Ugwumba *et al.* (2010) recognized that the coordinated cultivating frameworks received by respondents were crop-livestock (47.62%), crop-fish (9.52%), crop-fish-livestock (29.76%), livestock-fish (1 l.90%) and crop-livestock-agro(1.19%).A combination of one or more enterpriseswith cropping when carefully chosen, plannedand execute gives greater dividends than singleenterprise specially small and marginal farmswith large surplus farm labour and big humanforce, large supplies of products and farmwaste for cycling and diverse climate and thereis a great scope of integrated farming systemin India (Jayanthi *et al.,* 1994).

Why Integrated Farming Systems

Security in ranch salary through numerous undertakings that focus on most extreme usage of accessible normal assets to meet the family needs. It targets producing an edge level of homestead pay required for the ranch family to keep up continued enthusiasm for cultivating consequently keeping the movement of individuals from cultivating division. An integrated farming system, which is equivalent to family cultivating, gives a chance to beneficially connect with the accessible labor in the ranch family to the furthest reaches during the time prompting higher salary and family fulfillment. A decent IFS focuses on the least reliance on outside assets and productive reusing of accessible homestead assets. Even though IFS can be clarified as a framework

contained a few commonly strong and correlative agro-based undertakings, no normal model can be appropriate for all the circumstances. Uncertainties models must be created dependent on the agro-climatic circumstances, holding size, accessibility of assets like land, water, work, promoting offices, chance elements, family size, the capacity of the homestead relatives to take an interest in the cultivating movement, their insight/ability level and so forth.

Advantages of IFS

It is advantageous over cropping system as it is an intensive farming and creates job opportunities to the small and marginal farmers throughout the year, one enterprise may act as insurance to other in case of crop failure, byproduct of one enterprise may be used in other and also improves soil health and fertility in long run by increasing the nutritional value of soil (Olele*et al.,* 1999, Ugwumba *et al.,* 2010).

Types of Farming System

Crop based farming systems

In this framework, creatures are raised on agrarian squanders and creature power is employed for rural tasks, and voids are utilized as excrement and fuel. In rice-based creation framework at Orissa, in place preservation of downpour water by ideal wear tallness, saving abundance water within the asylums built at the downstream of rice field and rearing of fish within the shelters within the medium land upgraded absolutely the efficiency (James *et al.,* 2005). This framework recorded the foremost elevated net returns (Rs.2197/ha) with BC proportion (2.78) when contrasted with the event of rice along 915294/ha). the traditional fish yield during this framework was 1107 kg/ha in a very half year. The editing force was expanded from 100 to 131%. At Ranchi, the improved rice (IR-64) + fish (blended carps), wheat (PBW-443) upgraded the web returns (Rs. 58557/ha) when contrasted with the ranchers' practice of rice neglected (Rs. 2770/ha0 (TAR-IVLP, 2004). Alteration of crop geometry may help to accommodate intercrops without losing the bottom crop population (Rana, 2013). The cropping system should provide enough food for the family, fodder to the cattle and generate sufficient cash for domestic and cultivation expenses.(SK Choudhary *et al.,* 2019)

Agro forestry-based farming systems

Perpetual grass segments, other than conferring solidness to edit creation in bone-dry zones, likewise go about as vegetative channel strips for the anticipation of wind and water disintegration. Besides, the grass part improves the dirt natural issue and starts giving creation from the foundation year onwards. Development of grasses and vegetables uncovers that moth bean and mung bean in the proportion of 2:1 with grasses like *Lasiurus sindicu*s, *Cenchrus ciliaris, Cenchrus setigerus, and Dicanthiumannulatum*, are very encouraging. These harvests, other than giving a full yield of grass part, give the reward yield of grain (1.3 to 2.8 q/ha) and grub (3.5 to 6 q/ha). In any case, intercropping of grasses and dryland crops is regularly not practical under a rancher's smaller scale cultivating circumstance and, henceforth, a strip trimming of grasses and Kharif vegetables in 1:2 proportions is suggested, with a strip width of 5 m. The grass part in agri-field and silvi-field frameworks was more productive than they are ably cultivating. Financial assessment of the above interchange land use endeavors versus dryland crop development was completed by CAZRI, Jodhpur, accepting 18 years as a powerful period. The entire tree based frameworks demonstrated a higher advantage cost proportion over the unadulterated arable cultivating. Horticulture and backwoods are constantly helpless against the troublesome climatic condition. Characteristic disasters, for example, floods, dry spells, water logging and so forth happen

consistently, joined with the impacts of deforestation, wood debasement, and disintegration. Agroforestry is an aggregate name for land-use frameworks and advancements, in which woody perennials (trees, bushes, palms, bamboos, and so forth.) are intentionally consolidated on a similar land the executives unit as agrarian yields or potentially creatures, either in some type of spatial course of action or in a fleeting grouping for example Agroforestry is an incorporated self-continued land the board framework, with the presentation of the different segment like timber, mash, post, fuelwood, nourishment and medication with agrarian yields on a similar unit of land, meeting the biological and financial needs of ranchers.

In agro forestry frameworks, there are natural and practical connections among various segments. That suggests that: (I) agro forestry typically includes at least two types of plants (or plants and creatures) in any event one of which is woody perennials;(ii) an agro forestry framework consistently has at least two yields; (iii) the pattern of an agro forestry framework is in every case over one year; and (iv) even the most straightforward agro forestry framework is fundamentally, practically, and socio-monetarily more unpredictable than a mono editing framework. Agroforestry is significant for rationing soil and water, upkeep of soil fruitfulness, controlling saltiness and water logging, positive condition effect, and substitute land use for negligible and corrupted terrains. Determination of appropriate land use frameworks saves biophysical assets of non-arable land other than giving day-to-day needs of the rancher and domesticated animals inside the cultivating framework. This framework additionally gives to fluctuated requirements of the farmer improve work openings by spreading work needs which in any case are amassed in the cultivating framework (Anonymous, 2013).

The enduring attribute of trees assists with utilizing crop land through estate on corner limits with all around oversaw. The distinctive kind of agro-ranger service frameworks normally followed in India are: (1) Agri-silviculture (crops+ trees), which is prominently known as ranch ranger service (2) Agri-cultivation (crops + natural product trees); (3) Silvi-field (Trees + field + animals); (4) Agri-horti-silviculture (crops + organic product trees + MPTS (Multipurpose trees) + field); (5) Horti-silvi-field (organic product trees + MPTs+ Pasture); (6) Agri-silvi-field (crops +trees + Pasture); (7) Homestead agro forestry (different mix of different segments); (8)Silvi-apiculture (trees + bumble bees); (9) Agri-pisci-silviculture (crops + fish + MPTS); (10) Pisci-silviculture (Fish + MPTs) and so on.

Livestock based production system

The domesticated animals cultivating framework in rainfed agribusiness are mind-boggling and for the most part dependent on conventional financial contemplations. A comprehension of creation factors (domesticated animals, capital, feed, land, and work) and processors (depiction, analysis, innovation configuration, testing, and expansion) that impact creature creation is pre-imperative for animals' reconciliation. The efficiency of animals in cultivating frameworks in rainfed farming can be improved by expanded grub creation as an intercrop with oats, transfer and rear entryway trimming, scavenge creation on bunds, improving the taking care of estimation of stover by hacking, dousing with water, urea treatment, vital supplementation of concentrate, urea molasses mineral square for upgraded usage, improvement in profitability of grasses quantum and conveyance chooses the viable developing season and it gets basic in choosing editing frameworks for a given explanation. A

gainful impact of 15-25% in yield was and vegetables in corrupted grounds, the foundation of feed banks in zones where surplus feed is accessible, planned impregnation with semen affirmed bulls, expelling poor quality creatures through maiming and appropriation of preventive measure like immunization and de-worming through wellbeing camps (Mishra, A.K., 2002).

At CRIDA, field considers showed that urea treated straw expanded the milk yield running from 0.47 1.2 l/day with a normal increment of 0.8 l/ccw/day in IVLP towns of Ranga Reddy region. The paddy straw utilization was additionally expanded with 1-1.2 kg/creature because of this intercession. Urea molasses mineral block (UMMB) upgraded quality and amount of milk by 25-30% in cows and bison. It helped in keeping up the general wellbeing and efficiency of creatures especially when grub shortage was intense in the dry season period. Mineral supplementation gave higher milk yield (58%) and net returns (Rs. 816) contrasted with the rancher's practice of brushing alone which gave milk yield of 1.8 lit/day with net returns of Rs. 2156. Supplementation of rice grain @ 1.5% of body weight essentially improved the development pace of sheep and goats.

Dairy cultivating is a significant wellspring of pay to ranchers. Other than creating milk and additionally draft power, the dairy animals are the likewise acceptable wellspring of homestead yard fertilizer, which is an acceptable wellspring of a natural issue for improving soil ripeness. The ranch results thusly are productively used for taking care of the animals. Around 70% of Indian dairy animals and 60% of bison have extremely low efficiency. This part is exceptionally occupation serious and gives valuable livelihoods to over 70% of all rural and many urban family units. The part is profoundly gendered touchy and over 90% of the family's dairy undertaking is overseen by the family's ladies society.

Fisheries

Lakes fill different valuable needs, viz., residential necessity of water, beneficial water system source to connecting crop fields and pisciculture. With the conventional administration, ranchers acquire scarcely 300-400 kg of wild and culture fish per ha every year. Nonetheless, composite fish culture with the stocking thickness of 5000-7500 fingerlings/ha and beneficial taking care of can support the absolute biomass creation. A few systems are received for fisheries improvement, for example, the foundation of fish incubation center in aquaculture and utilization of regular and enduring lake for loading and all through the accessibility of good quality fingerlings and yearlings, to begin the incorporated fish cultivating cum refine aquaculture innovation and so on. The state government has upheld the establishment of fish feed plants and development of fish seed bring forth on sponsorships rate. To encourage fish showcasing, the plan of dispersion of sulked cum-cooler has been presented. A few wheeled vehicles have likewise been presented on sponsorships rates for the quick development of fish to the market.

Observed from integrated farming system studiesat Sirupura that rice-fish-poultry combinations gave highest net income (>157000/ha) with an improvement in soil health Channabasavanna*et al.* (2002).

Reported thatnutritional status of soil NPKshow increased trend from187 kg/ha to 262 kg/ha (40%), 29.3 kg/ha to 33.6 kg/ha(14.6%) and 503kg/ha to 530 kg /ha (5.4%), respectively inrice-fish poultry system over conventional system (rice-rice) (Channabasavanna and Biradar (2007)

Sericulture

Sericulture is characterized as an act of joining mulberry development, silkworm raising, and silk reeling. Sericulture is a perceived practice in

India. India involves the second situation among silk-delivering nations on the planet, close to China. At present, the 2.82 lakh ha region of mulberry manor delivers about 1.27 lakh huge amounts of reeling cases and 0.14 lakh huge amounts of crude silk. The absolute region under mulberry is 188 thousand ha in the nation. Sericulture is polished both in tropical and calm atmospheres. It assumes a significant job in the financial advancement of the rustic poor in certain zones. India sends out silk for the most part to the USA, Germany, United Kingdom, France, Italy, Singapore, Canada, UAE, Switzerland, Netherlands, Spain, Japan, Thailand, and so forth.

In India over 98% of mulberry-silk is created from five customary sericulture states, viz., Karnataka, Andhra Pradesh, West Bengal, Tamil Nadu, and Jammu and Kashmir. The climatic conditions in India are ideal for the lush development of mulberry and raising and silkworms consistently. The temperature in Karnataka state, significant silk delivering state in India, ranges from 21.2 to 300C. Climatic conditions in Kashmir are ideal for silkworms from May to October.

Poultry

Poultry is one in every of the quickest developing nourishment businesses on the earth. Poultry meat represents about 27% of the all-out meat devoured worldwide and its utilization is developing at a standard of fifty yearly. The poultry industry in India is usually another horticultural industry. Till 1950, it absolutely was viewed as a back yard calling in India. within the sixties, the event pace of egg creation was about 10% and it expanded to 25% within the seventies. the event rate boiled right down to 7-8% by1990 thanks to the worth ascend in poultry feed. By 2000, the all-out egg creation may reach up to 5000cores. Oven creation is expanding at a pace of 15% per annum. it absolutely was 31 million out of 1981 and expanded up to 300 million of each 1995 (Singh, 1997). About 330 thousand heaps of grilled meat is nowadays created. The traditional worldwide utilization is 120 eggs for every individual per annum and in India, it's just 32-33 eggs for every capita year. in line with the healthful proposal, the per capita utilization is assessed at 180 eggs/year and 9 kg meat/year.

Duck Rearing

Ducks represent about 7 percent of the poultry populace in India. They are mainstream in states like West Bengal, Orissa, Andhra Pradesh, Tamil Nadu, Kerala, Tripura, and Jammu and Kashmir. Ducks are transcendent of an indigenous kind and raised for egg creation on normal rummaging. They have a creation capability of around 130-140 eggs/flying creature/year. Ducks are very strong, all the more handily agonized and impervious to normal avian sicknesses. In places like muddy riverside, wetland, and desolate fields where chicken or some other sorts of stock don't prosper, duck rearing can be a better option.

Duck farming was a subsidiary source of income for almost all the farmers. People from all strata of the society, irrespective of religion, education, occupation and economic background were involved (R. Islam *et al.,* 2002).

It would be possible if they are supported with some feed supplements, vaccine, medicines as well as training. Duck is the most important poultry species that can contribute to provide employment to the unemployed youth, rural widow and women of the farmers in the low land areas(Shihan Parvez *et al.,*2020).

Apiculture (Beekeeping)

Apiculture is the science and culture of bumblebees and their administration. Apiculture is an auxiliary occupation and it is an extra wellspring of pay for ranch families. It requires low speculations thus can be taken up by little, minimal and landless ranchers and taught jobless youth.

Bihar is enhanced with exceptionally differentiated, bottomless honey bee greenery, and positive natural condition. The nectar creation potential is around multiple times (60-65 kg) higher than the national normal (20 kg) and high than any territory of India, viz., Punjab (30kg), H.P (35 kg), and Haryana (20 kg) per hive every year (Dalwai 2017).

The litchi nectar created in Bihar has better taste, shading, and flavor than the nectar delivered in different states because of variety in natural condition. Litchi nectar is well known and has popularity broadly and universally. Bumblebees go about as great pollinators and consequently improve the yield of different farming harvests. In Bihar, transitory beekeeping was created by AICRP (Honeybee), which has been demonstrated helpful for delivering various sorts of nectar in various territories, which brought about impressive increment in yield and province presence. By receiving transient beekeeping, beekeepers may gather diverse nectar streams just as their salary.

MUSHROOM PRODUCTION

Mushroom is an eatable growth with incredible assorted variety fit as a fiddle, size, and shading. Basically, a mushroom is a vegetable that is developed in secured cultivates in an exceptionally purified air. Much the same as different vegetables, mushroom contains 90% dampness with high in quality protein. Mushrooms are a genuinely acceptable wellspring of nutrient C and B complex. The protein has 60-70%digestibility and contains all fundamental amino acids. It is likewise a rich wellspring of minerals like Ca, P, K, and Cu. They contain less fat and CHO and are viewed as useful for diabetic and pulse patients. The healthful degree of poor ranchers can be improved by expanding mushroom creation. There is an impressive interest in restorative mushrooms notwithstanding consumable mushroom species. Straw is in effect better used by advancing mushroom creation. For this, the accessibility of mushroom seeds and quality manure is significant. Up until now, 7 mushroom range units have been built up in the state to beat the lack of its seeds. The creation is being energized by setting up a gathering of mushroom delivering ranchers, particularly the ladies ranchers. The creation is being connected to showcase. The legislature has likewise focused on arrangement 20 mushroom creation units and 10 mushroom range units by 2022.

CONCLUSION

The Integrated Farming System (IFS) could be a combined approach geared toward efficient sustainable resource management for increased productivity within the cropping system. The IFS approach has multiple objectives of sustainability, food security, farmer's security and poverty reduction by involving livestock, vermicomposting, organic farming etc. IFS provides a chance to extend economic yield per unit area by virtue of intensification of crop and allied enterprises especially for little and marginal farmers. it's the potential to create the world profitable by reducing the employment of chemical fertilizer and recycling nutrients. Effective recycling of products, by-products and waste in IFS is that the cornerstone behind the sustainability of farming system under resource poor condition in rural areas. Because of interaction of enterprises with crops, eggs, meat and milk, IFS provides flow of cash around the year amongst the farming community. Combining crop with livestock enterprises would increase the labour requirement significantly and would help in reducing the issues of underemployment and unemployment to a good extent. It provides enough scope to use family labour around the year. The IFS promotes for rejuvenation of systems productivity and to attain agro ecological equilibrium.IFS provides multiple benefits that are sustainable and may pave the way for climate-smart agriculture.

India must adopt a "well designed" Integrated Farming System (IFS) to understand the vision of doubling farmers' income by 2022 and having sustainable agricultural practices.

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INFLUENCE OF PRODUCT APPERANCE OF PACKAGED FOOD PRODUCTS FOR CHILDREN IN JAMMU CITY OF UT JAMMU AND KASHMIR

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ABSTRACT

The present research was conducted in Jammu City for exploring the influence of product appearance of packaged food products for children on purchase intention of customer. The study was carried out on the basis of primary as well as secondary data. The research was conducted with the help of questionnaire based on the information collected from the customers of Jammu City. Total sample of 100 respondents were taken. Percentage analysis, Garrett ranking and weightage mean technique were used for analysis of data. Organised retail outlets i.e. (54.00 per cent) were found to be preferred store type for purchase of packaged food products. The weekly expenditure that mostly spends on purchase of packed products is between Rs 400-600 i.e. (37.00 per cent). Also the study found that majority of the respondents i.e. (92.00 per cent) get influenced by product appearance .Using Garrett ranking technique, in store presentation was ranked as 1st factor influencing source of information for children.

Keywords : *Customers, perception, packaged food products, children*

INTRODUCTION

Children are attracted by special product appearance attributes such as flavour, packaging, cartoon character, shape and design. With advertising innovations, food manufacturers are gaining more and more access to children through the use of television. Nowadays food choices are highly related to preferences. They mostly prefer that products which have attractive appearance and catch their eyes towards it. Children insist their parents to buy those products from stores. The consumer's intention or willingness to buy a product is the consumer's buying goal. The consumer's intention to buy changes over time and changes in

preferences and preferences, over time, with the community or by past experience (Shiau and Luo 2012). As children around 4-8 years of age are not bothered about the products which are healthy for them or not and prefer healthy food products till around 9-11 years of age. In recent years the consumer's choice is changing day by day. Kids always pressure their parents to buy whatever they want with the power of posters. Children are exposed to thousands of food advertisements when they watch television. Sweet breakfast cereals, candies, snacks are commonly found on television by which they are attracted towards the product. In fact, all factors in a package such as size, shape, colour, characters and images can influence young children's choice behaviour and purchase decisions. The image of the product was made with the consent of the product. The various recommendations that are appropriate for that product will have a positive effect on the purpose of the purchase. Product endorsements in food products, will give a positive impact on purchases. This includes confidence in the consumer set. Even if it is permitted by origin and other ethnic preferences, it can get the start of sales of that product (Guercini and Ranfagni 2013). The opinion expressed in 312 Norwegian respondents bought the intention of the respondents after dealing with packaging because the installation evokes positive and negative feelings of the respondents, hence directly influencing the intention to buy respondents (Koenig-Lewis, Palmer,Dermody and Urbye 2014).

Table - 1 : Purchase of packaged food products for children

Products (n=100)	Regularly (5)	Periodically (4)	Occasionally (3)	Rarely (2)	Not at all Preferred (1)	Total	TWS (Total Weightage Score)	Rank
Breakfast Cereals	35	28	18	16	3	100	264	I
Percentage	35.00	28.00	18	16	3	100		
Snacks	21	47	25	5	2	100	226	II
Percentage	21	47	25	5	2	100		
Chocolates	24	38	31	6	1	100	207	III
Percentage	24	38	31	6	1	100		
Jelly	11	26	35	19	9	100	192	IV
Percentage	11	26	35	19	9	100		

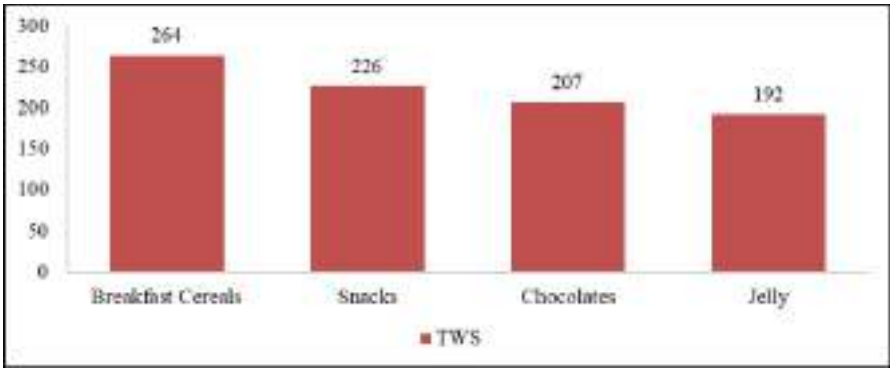

Fig. - 1 : Purchase of packaged food products for children

MATERIALS AND METHODS

The research was conducted with the help of questionnaire based on the information collected from the customers in Jammu city. This study was adopted both the primary data as well as the secondary data. The primary data were collected from the customers and the secondary data were collected from journals, magazines, Advertisements. The sample size was 100 customers (parents accompanying in the age of 1-8 years). After the collection of data, the results were analyzed by using some statistical tools like percentage analysis, weightage mean and Garrett ranking.

RESULTS AND DISCUSSION

Purchase of packaged food products for children

Table 1 and Figure 1 show that the respondents were enquired about the purchase of selected packaged food products. They were enquired how often they let their children to purchase packaged food products. In case of breakfast cereals, 35 respondents purchase regularly, 28 respondents purchase periodically, 18 respondents purchase occasionally, 16 respondents purchase rarely and 3 respondents were not purchasing any product. In case of snacks, 21 respondents purchase regularly, 47 respondents purchase periodically, 18 respondents purchase occasionally, 16 respondents purchase rarely and 3 respondents were not purchasing any snack. In case of chocolates, 24 respondents purchase regularly, 38 respondents purchase periodically, 31 respondents purchase occasionally, 6 respondents purchase and 1 respondent was not purchasing any chocolate. In case of jelly, 11 respondents purchase regularly, 26 respondents periodically, 35 respondents purchase periodically, 35 respondents purchase occasionally, 19 respondents purchase rarely and 6 respondents were not purchase any type of jelly. By using weightage average, breakfast cereals was ranked as 1st position, followed by snacks, chocolates, jelly were ranked as 2nd, 3rd and 4th position respectively.

Table - 2 : Weekly expenditure spend on purchase of packaged food products

Expenditure	Frequency	Percentage (%)
Less than Rs 200	20	20
Rs 200-400	28	28
Rs 400-600	37	37
Rs 600-800	10	10
More than Rs 800	5	5

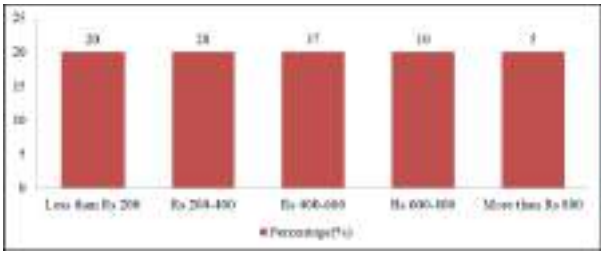

Fig. 2 : Weekly expenditure spend on purchase of packaged food products

Weekly expenditure spend on purchase of packaged food products

Table 2 and Figure 2 depict about weekly expenditure spend on purchase of packaged food products. Out of 100 respondents, 37 respondents i.e. (37.00 per cent) spend Rs 400-600, 28 respondents i.e. (28.00 per cent) spend Rs 200-400, 20 respondents i.e. (20.00 per cent) spend less than Rs 200, 10 respondents i.e. (10.00 per cent) spend Rs 600-800, 5 respondents spend Rs more than Rs 800.

Table - 3 : Preference towards the type of packaged food products for children

Products	Total Score	Average	Rank
Chocolates	5832	58.32	I
Snacks	5596	55.96	II
Breakfast Cereals	5400	54	III
Jelly	4460	44.6	IV

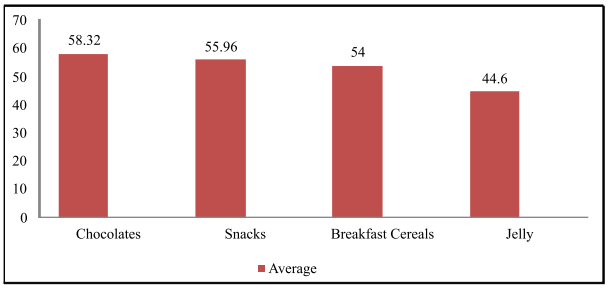

Fig. - 3 : Preference towards the type of packaged food products for children

Preference towards the type of packaged food products for children

Table 3 and Figure 3 represent the preference of buying the packaged food products for children towards packaged food products. By using Garrett ranking techniques, chocolates were ranked as 1st, followed by snacks, breakfast cereals and jelly were ranked as 2nd, 3rd and 4th respectively.

Table - 4 : Preference of store type to purchase packaged food products

Retail Formats	Frequency	Percentage (%)
Organised Retail Outlets (Big Bazar, Easy day, etc.)	54	54
Unorganised Store	30	30
Nearby Convenience Store	16	16

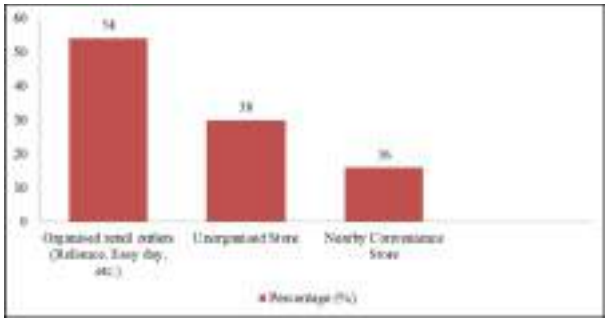

Fig. - 4 : Preference of store type to purchase packaged food products

Preference of store type to purchase packaged food products

Table 4 and Figure 4 depict the preference of store type. Out of 100 respondents, 54 respondents i.e. (54.00 per cent) preferred organised retail outlets (Reliance, Easy day, etc.), 30 respondents i.e. (30.00 per cent) preferred unorganised store and 16 respondents i.e. (16.00 per cent) preferred nearby convenience store.

Table - 5 : Influence of product appearance during the purchase of packaged food products

Influence of Product Appearance	Frequency	Percentage (%)
YES	92	92
NO	4	4

Influence of product appearance during the purchase of packaged food products

Table 5 and Figure 5 show that 92 per cent of respondents influenced by product appearance during the purchase of packaged food products.

CONCLUSION

This study concluded that the majority of respondents spend Rs 400-600 i.e. (37.00 per cent) on purchase of packaged food products weekly. The appearance influenced the choice of respondents i.e. (92.00 per cent) during the purchase of products. The respondents i.e. (54.00 per cent) preferred organised retail outlets. It was found that chocolates were mostly preferred by the children.

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ALGAE AS A SOURCE OF NUTRACEUTICALS

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ABSTRACT

In the recent years, a growing interest for nutraceutical algae has been developed, due to their effective health benefits, as a potential alternative to the classic drugs. Global demand for macroalgal and microalgal foods is growing, and algae are increasingly being consumed for functional benefits beyond the traditional considerations of nutrition and health. The use of blue-green algae Spirulina, Aphanizomenon, the microalgae Chlorella, Dunaliella, Haematococcus, Nannochloropsis, and Seaweed Gracilaria, as nutraceuticals and dietary supplements, nutritional components and evidence-based health benefits are discussed in details. Algae contain a wide range of nutrients including proteins; lipids; carbohydrates; and trace nutrients, including vitamins, antioxidants, and trace elements. These compounds have the characteristics to serve as natural nutritional supplements in human and animal feed and have many health-promoting effects. Algae contain many valuable compounds, which includes omega-3 fatty acids, vitamins and pigment protein complexes etc. There is no doubt that the algal biomass-derived food ingredients will serve as a "wonder molecule" for the mankind.

Keywords : *Algae; nutraceuticals; food products and ingredients; health benefits.*

INTRODUCTION

As global population is increasing, there is an increased demand for sustainable food supplements. Nutraceuticals are nutrients from food or food products that not only supplement the diet, but also facilitate the prevention or treatment of a disease and/or disorder. The term nutraceuticals originated from the root words "nutrition" and "pharmaceuticals." Dr. Stephen L. De Felice defines nutraceutical as "a food (or part of a food) that provides medical or health benefits, including the prevention and/or treatment of a disease." The major difference between pharmaceuticals and nutraceuticals is that the former is used as a drug to treat diseases and the latter as nutritional supplements that are intended to prevent diseases. In

the recent years, a growing interest for nutraceutical algae has been developed, due to their effective health benefits, as a potential alternative to the classic drugs. 2

The algae and microalgae are an extremely diverse group of organisms that contain many bioactive molecules, including pigments, polyunsaturated fatty acids, polysaccharides, polyphenol, etc. Algae and their bioactive molecules have a variety of health benefits such as antioxidant, anti-inflammatory, anticancer or anti-obesity effects. These algae form the source of the food chain for more than 70% of the world's biomass. Algae live in complex natural habitats and can adapt rapidly in extreme conditions (in variation of extreme weather conditions). This ability makes them capable to produce secondary metabolites, with novel structure and biologically active functions. Algae produce some useful bio-products including β-carotene, astaxanthin, docosahexaenoic acid (DHA), eicosapentaenoic acid (EPA), bioactive and functional pigments, natural dyes, polysaccharides, antioxidants, and algal extracts. They are low caloric food but rich in vitamins, minerals and essential trace elements, polyunsaturated fatty acids, bioactive metabolites, proteins, polysaccharides and dietary fibers.

In recent decades, there has been an increasing interest from researchers and the pharmaceutical industry in algae. This fact is due to their enormous potential as a source of molecules and bioactive substances, which may be used in the development of new drugs. Today, in addition to the conventional wisdom, it is known undoubtedly that many of the resulting compounds of algae from secondary metabolism act as stimulators of the primary metabolism of the person who ingests it, stimulating the activity of certain endocrine glands, blood circulation, exchanges of mineral elements, and the physiological elimination of toxins. Due to recent studies in this area of knowledge, several of these compounds were characterized, and their respective pharmacological properties were determined as cholesterol reducers, antimicrobials, antitumor, antiviral, anthelmintics, anti-inflammatory, antacids, growth regulators, immunoregulatory, etc.

In addition to benefits of regular consumption of algae in diet, the medicinal properties of algal bioactive compounds have been historically recognized. For example, algae are used for treatment and for prevention of goiter, which is caused by the lack of iodine in the diet. Several studies have shown various remedial effects of algal species against non-communicable diseases such as inflammation, obesity, diabetes, hypertension and viral infections. Though, some evidence suggests that the effect of bioactive compounds on the human body is moderate and may last over relatively short periods but they could contribute significantly if consumed routinely as part of the daily diet.

NUTRITIONALLY IMPORTANT ALGAE

1. Spirulina

Spirulina is both a salt and fresh water blue-green algae, which is being increasingly studied recently. *Spirulina* (classified as *Arthrospira* sp.) is a Cyanophytes present in free-floating filaments in the form of an open left-hand helix characterized by cylindrical multicellular trichomes. It occurs naturally in tropical and subtropical alkaline hot lakes with high pH values and high salt concentrations, like carbonate and bicarbonate. Among the many varieties of 3

spirulina, the most commonly studied species are *Spirulina platensis (Arthrospora platensis), Spirulina maxima (Arthrospora maxima)* and *Spirulina fusiformis (Arthrospora fusiformis). Spirulina* is composed of numerous antioxidants, including beta-carotene, phycocyanin, tocopherols, micronutrients, polyunsaturated fatty acids,

particularly gamma linolenic acid and phenolic compounds. The high nutritive values of spirulina were recognized by the Intergovernmental Institution for the use of Microalgae *Spirulina* against Malnutrition in the 1970s, where they launched *Spirulina* to fight against starvation and malnutrition. *Spirulina* has also been recognized and recommended by National Aeronautics and Space Administration and the European Space Agency for food supplementation during long-term space travels. *Spirulina* is a low-cost nutritional supplement and has not been established to have any significant side effects. Metabolic syndrome is currently on rise and dyslipidemia and obesity are an integral component of its causation. While there are several other supplements being evaluated for lipid lowering and weight loss effects, benefits from supplementation of spirulina are not limited to the above benefits but also extends to its antiviral, anticancer, antioxidant, antidiabetic, anti-inflammatory, hepatoprotective, cardioprotective and immunity boosting properties.

2. Chlorella

Chlorella is a green unicellular alga (Chlorophyta) that is commercially produced and distributed worldwide as a dietary supplement. *Chlorella* products contain numerous nutrients and vitamins, including D and B12, that are absent in plant-derived food sources. *Chlorella* contains larger amounts of folate and iron than other plant-derived foods. *Chlorella* supplementation to mammals, including humans, has been reported to exhibit various pharmacological activities, including immunomodulatory, antioxidant, antidiabetic, antihypertensive, and antihyperlipidemic activities. Meta-analysis on the effects of *Chlorella* supplementation on cardiovascular risk factors have suggested that it improves total cholesterol levels, low-density lipoprotein cholesterol levels, systolic blood pressure, diastolic blood pressure, and fasting blood glucose levels but not triglycerides and high-density lipoprotein cholesterol levels. These beneficial effects of *Chlorella* might be due to synergism between multiple nutrient and antioxidant compounds. However, information regarding the bioactive compounds in *Chlorella* is limited.

3. Dunaliella

Dunaliella (D. salina) is a unicellular green alga which contains large amounts of β-carotene, glycerol, and protein that can easily be extracted through its thin cell wall. *Dunaliella* does not required waters appropriate for agricultural and domestic uses and can be cultured in brackish water, marine water, and highly saline water. Global production of *Dunaliella* is estimated to be 1200 tons dry weight per year. The dominant companies that produce *Dunaliella*, mainly for beta-carotene production, are located in Israel, China, the USA, and Australia and include Betatene, Western Biotechnology, AquaCarotene Ltd., Cyanotech Corp., and Nature Beta Technologies. *Dunaliella* produces many carotenoid pigments with the dominant being beta-carotene and smaller amounts of lutein and lycopene. Some strains of *Dunaliella* contain up to 14% of beta-carotene on 4 dry weight basis. The total carotenoid content of *Dunaliella* varies with the physicochemical parameters and growth conditions. In optimal environmental condition, it can yield around 400 mg beta-carotene/m2 of cultivation area. Carotenoids from *Dunaliella* are potent free radical scavengers that reduce levels of lipid peroxidation and enzyme inactivation, thereby restoring enzyme activity. Research has shown beta-carotene to prevent cancer of various organs like the lungs, cervix, pancreas, colon, rectum, breast, prostate, and ovary by means of antioxidant activity. It has also been shown to promote regression of certain types of cancer. Supplements of *Dunaliella* have also shown

excellent hepatoprotective effects and reduced the occurrence of liver lesions.

4. Haematococcus

Haematococcus pluvialis is unicellular biflagellate freshwater green microalga. This species is known for its ability to accumulate large quantities of strong antioxidant astaxanthin (up to 2–3% on dry weight) under any conditions. The principal commercial astaxanthin-producing microalga is *H. pluvialis*. Astaxanthin is used as a nutritional supplement and anti-inflammatory and anticancer agent for cardiovascular diseases and is recently recorded to prevent diabetes and neurodegenerative disorders and stimulates immunization. It also has anti-inflammatory properties and is used for various commercial applications in the dosage forms as biomass, capsules, creams, granulated powders, oils, soft gels, syrups, and tablets. Photoautotrophic culture of *H. pluvialis* is mainly carried out in open raceway ponds or closed photobioreactors. The accumulation of astaxanthin is affected by environmental factors such as light, temperature, pH, salt concentration, and nutritional stresses. The cellular composition of *H. pluvialis* varies notably between its "green" and "red" stages of cultivation. *H. pluvialis* can accumulate approximately 5% DW of astaxanthin which is considered as a natural source of this high-value carotenoid protein.

5. Aphanizomenon

Aphanizomenon is a prokaryotic blue-green alga commonly found in freshwater systems. There are approximately 500 tons of dried *Aphanizomenon* produced annually for use in food and pharmaceutical industries. The dominant production source of *Aphanizomenon* in North America is Upper Klamath Lake and Klamath Falls, Oregon, and currently constitutes a significant part of the health food supplement industry throughout North America. *Aphanizomenon* contains a significant amount of C-phycocyanin, a light-harvesting pigment. It has antioxidant and anti-inflammatory properties. *Aphanizomenon* also exhibits high hypo-cholesterolemic activity, significantly greater than soybean oil, which decreases blood cholesterol and triglyceride levels. It also produces polyunsaturated fatty acids (i.e., omega 3 and omega 6), a deficiency of which has been linked to immunosuppression, arthritis, cardiovascular diseases, mental health issues, and dermatological problems.

6. Nannochloropsis

Nannochloropsis is a unicellular green alga that is rich in PUFA. Nowadays, it is widely used as an energy-rich source in aquaculture. It is also used for biodiesel production from photosynthetic organisms. *Nannochloropsis* is actually in use as a food additive for human nutrition and it is also served at the restaurant "A Poniente" of El-Puerto de Santa Maria (Cadiz, Spain) close to the natural environment where *Nannochloropsis gaditana* was first isolated and still grows. *Nannochloropsis* is an emerging microalga with high omega-3 fatty acid content especially EPA. Many companies are using *Nannochloropsis* for the commercial production of omega-3 fatty acids.

7. Gracilaria

Gracilaria is a genus of red algae (Rhodophyta) notable for its economic importance as an agarophyte, as well as its use as a food for human. The macroalgae belonging to this genus are important for industrial and biotechnological uses and are considered economically valuable resources, because of their ability to achieve high yields of commercially valuable biomass. In fact, they contain, besides other compounds, phycocolloids, the main source of agar-agar, which is a gelatinous non-toxic colloidal carbohydrate present in the cell wall and intercellular spaces of the algae and has wide use in the preparation of food, ice

creams, jellies, soups, bacteriological samples and cosmetics. These algae are also sources of important bioactive metabolites with antibiotic activity; but also, sources of different prostaglandins and other substances that may be toxic to humans by causing gastrointestinal disorders and lethality.

CONCLUSION A

Algae from marine and freshwater ecosystems are known for their potential to produce food ingredients and bioactive compounds since ancient times. Algal biomasses are now being widely cultivated to make the commercial formulation of functional foods and nutraceutical application. Algae contain many valuable compounds, which includes omega-3 fatty acids, vitamins and pigment protein complexes etc. Even terrestrial plants could not be the producer of certain essential food ingredients and bioactive compounds, for which we majorly depend on algal sources. Considering the current shrinking arable land, persistent pesticides in food grains and leafy vegetables, and lifestyle-related diseases, there is no doubt that the algal biomass-derived food ingredients will serve as a "wonder molecule" for the mankind. Comprehensive knowledge of therapeutic food products as well as the emerging trend towards the development of the functional food industry, algal products could have enormous potential as they are linked with high vitamin, high fiber, high minerals and high omega-3-fatty acids which in turn could provide high commercial scope. The versatility and the huge potential of microalgae could make a significant difference in pharmaceutical, cosmetics, and food industries in the forthcoming years.

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