Vol. 19 January - June, 2024 No. 1

ABSTRACTED IN CABI, U.K., SHIMAGO, CROSS REF, INDIAN CITATION INDEX AND GOOGLE SCHOLAR, PUBLONS, CITEFACTOR

Journal of Natural Resource And Development

(Peer Reviewed, Refereed Research Journal of Agriculture and Science)

Abbreviated title of Journal : *Jour. Nat. Res. Dev.*

NAAS RATING : 4.23

online @ www.sbsrd.org

SOCIETY OF BIOLOGICAL SCIENCES AND RURAL DEVELOPMENT
10/96, Gola Bazar, New Jhusi, Prayagraj - 211 019 (U.P.), INDIA

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Vol. 19 January - June, 2024 No. 1

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Journal of Natural Resource and Development 19 (1) 1-6, 2024 | NAAS RATING : 4.23 | ISSN-0974-5033

POPULATION DYNAMICS OF BUD FLY, DASYNEURA LINI (BRANES) IN ASSOCIATION WITH WEATHER VARIABLES UNDER AGRO-ECOSYSTEM OF LINSEED

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Received : 11.09.2023 Accepted : 05.01.2024

ABSTRACT

A field experiment was carried out at Banda University of Agriculture and Technology, Banda, Uttar Pradesh during two consecutive cropping seasons of *Rabi*, 2021-22 and 2022-23 to find out the effect of weather variables on infestation of linseed bud fly, *Dasyneura lini* (Branes) in bundelkhand region. The infestation of linseed bud fly was observed from 5th standard week (SW) to 13th SW of both the years. The maximum infestation(42.42 & 31.72) was recorded at dough stage of the crop growth during both the cropping seasons. The maximum and minimum temperatures were found more encouraging for this insect during this period. However, morning and evening relative humidity had negative association with infestation of linseed bud fly.

Keywords : *Agro-ecosystem, bud fly, dynamics, linseed, population, weather.*

INTRODUCTION

Linseed, *Linum usitatissimum*(L.) is an important oilseed crop which belongs to the family: Linaceae. It is an important industrial and fiber producing crop. This crop is grown either for oil or fiber. Its grain is rich in oil (41%), protein (20%), dietary fiber (28%), moisture (7.7%) and ashes (3.3%). Around the globe, linseed crop occupies an area of 22.70 lakh ha yielding out 22.39 lakh ton having an average productivity of 986 kg/ha. In India, it is cultivated in an area of 3.29 lakh ha with production and productivity being 1.46 lakh ton and 484 kg/ha, respectively. India ranks second in terms of area after Canada, which contributes about 14.89% and 6.56% to world area and production, respectively. Linseed crop is attacked by a number of insect pests at various stages of its growth. Among which linseed bud fly, *Dasyneura lini*(Barnes) causing 88% grain yield losses and it is considered as a key pest of this crop (Mukherji*et al*., 1999). The infested buds become hollow and unproductive. Studies on pest succession of any crop are essential as it provide information on the status of various insect pests and also helps in identifying the most critical stage of the crop. This information would help in developing an efficient management module for linseed bud fly, *Dasyneura lini*(Barnes) attacking at various growth stages of the crop. Keeping above facts in mind, the present experimenton effect of weather variables on infestation of linseed bud fly, *Dasyneura lini* (Branes) in bundelkhand region was therefore undertaken with objective to record the infestation of bud fly and its association with weather variables inagro-ecosystem of linseed.

MATERIALS AND METHODS

The experiment was laid out at Banda University of Agriculture and Technology, Banda,

Uttar Pradesh during cropping season of *Rabi*, 2021-22 and 2022-23. The linseed var. BUAT-Alsi-3 was sown in 4th week of November with plot size of 15 m^2 (10 rows of 5 meter length) having crop spacing of 30×10 cm and replicated thrice during both the years. The recommended agronomic practices except plant protection measures were followed. The seasonal incidence of linseed bud fly was recorded at weekly interval on 5 randomly selected plants from each plot. The incidence of bud fly was estimated by making count on the basis of number of infested bud per plant and total number of healthy bud. The percent bud infestation was calculated by using formula:

$$\text{Percent bud fly Infestation} = \frac{\text{Number of infested bud}}{\text{Total number of buds}} \times 100$$

The observationson infestation of linseed bud fly and fluctuations in weather variables were recorded at weekly interval. The infestation of linseed bud fly were averaged and subjected to analysis of simple correlation and regression coefficients by considering infestation of bud fly as dependent factor and temperature, humidity, wind velocity and rainfall as independent factors of linseed agro-ecosystem.

$$\text{Correlation coefficient (r)} = \frac{\Sigma(X-\bar{X})(Y-\bar{Y})}{\sqrt{\Sigma(X-\bar{X})^2\Sigma(Y-\bar{Y})^2}}$$

$$\text{Regression coefficient (byx)} = \frac{\Sigma(X-\bar{X})(Y-\bar{Y})}{\sqrt{\Sigma(X-\bar{X})^2}}$$

The regression equations were derived by using following formula as suggested by Panse and Sukhatme (1985).

$$\text{Regressios equation} \rightarrow (Y-\bar{Y}) = byx(X-\bar{X})$$

Where:

$X \rightarrow$ Independent variables (weather variables),

$\bar{X} \rightarrow$ Mean of independent variables,

$Y \rightarrow$ Dependent variables (insect populations),

$\bar{Y} \rightarrow$ Mean of dependent variables and

byx→ Regression coefficient of Y on X

RESULTS AND DISCUSSION

The infestation of linseed bud fly wasrecorded in agro-ecosystem of linseed var. BUAT-Alsi-3 during the cropping seasons of *Rabi*, 2021-22 and 2022-23. The correlation and regression co-efficient were calculated to find out the associations of linseed bud fly infestation (dependent factor) with weather variables (independent factor). The summary of observationson infestation of linseed bud fly and weather data with respect to the standard week during *Rabi*, 2021-22 and 2022-23 is cited in table 1&2, respectively. The incidence of bud fly was first recorded on the crop with the formation of buds during 5th standard week with 3.25 & 2.21 percent bud infestation. It remained continue throughout the cropping period. The infestation of insect increased gradually with highest infestation at 13th standard week with 42.42 & 31.72 percent bud damage during *Rabi*, 2021-22 & 2022-23, respectively. The intensity of infestation was initially one to two larvae per bud in last week of January (Table-1&2). According to Singh *et al*., 1998, maximum numbers of larvae (16-25 larvae/bud) were recorded during last week of February and middle of March. The maximum bud infestation was observed as11.82 and 10.22 % during last week of February to mid-March by Malik *et al*., 1998.

The correlation and regression coefficients of bud fly infestation with weather variables revealed that incidence of insect had significant positive correlation with maximum (0.862 & 0.885) and minimum (0.912 & 0.915) temperature during both the cropping seasons (Table-3). This result is found to be in close association with the result

obtained by Singh *et al*. (2013), Ekka*et al.* (2017) and Sahoo (2016). However, morning (-0.845) and evening (0.837) relative humidity showed significant negative association with occurrence of this insect during *Rabi*, 2021-22 only. Remaining associations were found non-significant either during *Rabi*, 2021-22 or 2022-23 or both (Table-3). This result is supported by Mishra and Shamshad (2007), Singh et al. (2013) and Sahoo (2016). This might be because of the rate development of pests would enable a more rapid response to a change in temperature (Karuppaiah and Sujayanad, 2012).

The influences of maximum & minimum temperature, morning & evening relative humidity, wind velocity and rainfall on population buildup of linseed bud fly were driven out through step down regression analysis. It was perceived that the combined influence of weather variables had more influence on infestation of bud fly with R^2=0.0896 & 0.961 than the single weather variable with R^2 value was only 0.742 & 0.782 during cropping season of *Rabi*, 2021-22 & 2022-23 respectively. The combined effect of temperature (Maximum & Minimum) and relative humidity (Morning & Evening) with R^2 value of 0.863 & 0.935 and when relative humidity was deleted the R^2 value comes down to 0.850 & 0.923. This shows that maximum temperature have comparatively more influences on bud fly infestation with R^2 value of 0.742 & 0.782 during both the cropping seasons respectively (Table-4). Similar observations were also reported by Sahoo (2016).

CONCLUSION

The multiplication of linseed bud fly was most suited during February and March, which prefers almost all living organism available over here. The study on association of bud fly infestation with weather variables revealed significant values in most of the cases as temperatures and relatives humidity. From the step wise regression equation it may be concluded that combined effect of weather factors had more influence on insect infestation.None of the weather factor alone had much more influence on them except maximum temperature.

Table-1: Effect of weather on infestation of bud fly in agro-ecosystem of linseed during- *Rabi*- 2021-22

SW	Bud fly infestation (%)	Temperature (^{o}C)		Relative Humidity (%)		Wind Velocity (Km/Hr)	Rainfall (mm)
		Maximum	Minimum	Morning	Evening		
4	0.00	20.6	8.7	80.86	46.86	3.43	0.04
5	3.25	24.6	10.1	76.43	38.00	0.29	0.0
6	5.73	25.1	10.7	77.29	39.86	1.43	0.0
7	15.17	28.0	12.3	69.43	28.57	0.86	0.0
8	34.05	29.6	14.6	61.00	32.71	2.00	0.0
9	36.03	28.1	16.6	68.29	30.00	1.71	0.0
10	37.05	33.0	17.4	61.14	26.29	2.71	0.0
11	38.04	38.1	22.0	60.00	27.86	3.00	0.0
12	40.03	38.9	22.7	41.14	17.29	4.57	0.0
13	42.42	42.0	23.9	40.00	12.14	4.14	0.0

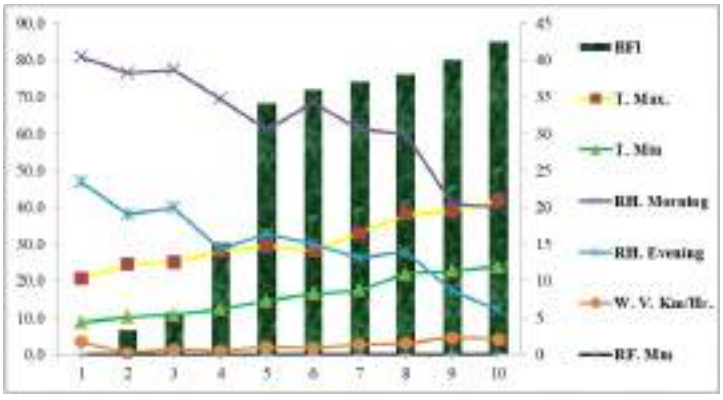

Fig.- 1 : Linseed bud fly infestation vsweather variables during*Rabi*-2021-22.

Table-2 : Effect of weather on infestation of bud fly in agro-ecosystem of linseed during*Rabi*- 2022-23

SW	Bud fly infestation %	Temperature ^{o}C		Relative Humidity (%)		Wind Velocity (Km./Hr.)	Rainfall (mm)
		Maximum	Minimum	Morning	Evening		
4	0.00	24.4	14.9	85.6	67.6	3.3	88.0
5	2.21	23.0	14.9	73.0	36.0	4.3	0.0
6	4.31	27.7	13.3	60.6	29.3	3.7	0.0
7	9.38	28.0	13.9	72.4	35.6	1.4	0.0
8	12.71	32.0	17.3	57.1	27.4	2.0	0.0
9	23.81	32.9	18.3	57.3	31.3	2.9	0.0
10	24.50	31.0	18.1	65.9	34.4	1.7	14.0
11	25.84	30.9	20.9	66.4	45.0	1.7	0.0
12	27.51	32.3	21.1	62.7	36.1	2.9	7.0
13	31.72	33.4	20.9	56.4	38.3	3.9	0.0

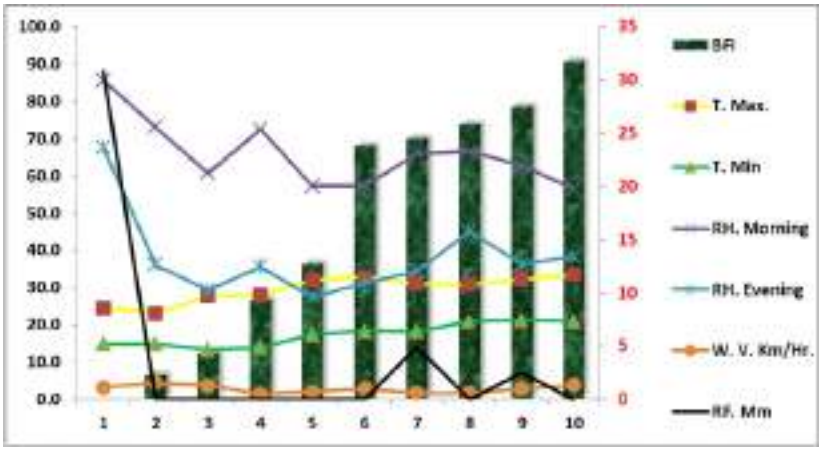

Fig.-2 : Linseed bud fly infestation vs weather variables during *Rabi*-2022-23.

Table - 3 : Correlation and Regression coefficients of infestation of bud fly with weather variables

Weather Variables	Correlation Coefficient			Regression Coefficient		
	2021-22	2022-23	Pooled	2021-22	2022-23	pooled
Max. Temp.	0.862**	0.885**	0.957**	-2.95*	3.823	-0.673
Min. Temp.	0.912**	0.915**	0.942**	5.65*	1.482	3.294
Morning RH	-0.845**	-0.630	-0.259	-0.74*	1.135	-0.515
Evening RH	-0.837**	-0.885**	-0.710*	0.319*	-0.096	-0.492
Wind Velocity	0.546	-0.259	0.252	-3.096	3.028	-6.098
Rainfall	-0.519	-0.422	0.450	-124.115	-0.175	0.413

*Significant at 1 per cent level, **Significant at 5 per cent level

Table-4 : Regression equations appraising the influence of weather variables on infestation of bud fly in agro-ecosystem of linseed

Cropping Season	Multiple Regression Equation	R^2
2021-22	$Y=71.64-2.95X_1+5.65X_2-0.74X_3+0.31X_4-3.09X_5-124.11X_6$	0.896
	$Y= 74.48-2.89X_1+5.78X_2-0.82X_3+0.36X_4-4.35X_5$	0.895
	$Y=40.60-2.31X_1+4.69X_2-0.08X_3-0.45X_4$	0.863
	$Y=31.79-1.89X_1+4.56X_2-0.28X_3$	0.856
	$Y=-2.64-1.48X_1+4.63X_2$	0.850
	$Y=-39.48+2.09X_1$	0.742
2022-23	$Y=-199.95+3.82X_1+1.48X_2+1.13X_3-0.09X_4+3.02X_5-0.17X_6$	0.961
	$Y=-146+2.66X_1+2.34X_2+0.80X_3-0.40X_4+1.77X_5$	0.941
	$Y=-93.14+1.70X_1+2.52X_2+0.37X_3-0.24X_4$	0.935
	$Y=-69.78+1.53X_1+2.22X_2+0.03X_3$	0.923
	$Y=-65.91+1.45X_1+2.25X_2$	0.923
	$Y=-68.53+2.86X_1$	0.782

Note: X_1= Maximum temperature (°C); X= minimum temperature (°C); X_3= morning RH (%); X_4= evening RH (%); X_5= wind velocity (Km/h) andX_6= Rainfall (mm).

ACKNOWLEDGEMENT

Thanks to Banda University of Agriculture and Technology, Banda, Uttar Pradesh to provide facilities in terms of administrative and financial during experimentation at farm.

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Journal of Natural Resource and Development 19 (1) 7-11, 2024 | NAAS RATING : 4.23 | ISSN-0974-5033

EVALUATION OF VARIOUS CONSTRAINTS ENCOUNTERED IN FERTILIZER DISTRIBUTION AND MARKETING IN JAMMU DISTRICT (J&K UT)

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Received : 25.10.2023 Accepted : 15.12.2023

ABSTRACT

An investigation is done to know about the obstacles that have been perceived by wholesalers, dealers and farmers dealing with the fertilizer marketing. For this, we have selected the Jammu district. The research was conducted with the help of well-prepared questionnaire based on the information collected by interviewing the respondents from Bishnah and R.S. Pura blocks of the Jammu district. The conventional sampling technique was used. From each block, two villages each were selected and finally ten farmers from each village were selected randomly, thus made a total sample of forty farmers. Also to know about the market pattern, 5 wholesalers and 15 dealers were also chosen. After obtaining the data, Garrett ranking technique was used to analyze the data and various constraints were found. The results revealed that the major constraints perceived by wholesalers, dealers and farmers was non-availability of credit facilities (Rank 1).Late receiving (Rank 2), storage problem (Rank 3), lengthy procurement (Rank 4) and so on, in case of wholesalers. For dealers, lengthy procurement (Rank 2), transportation charges (Rank 3), Storage problem (Rank 4) and so on. In case of farmers, inadequate subsidy (Rank 2), transportation charges (Rank 3), storage problem (Rank 4) etc. From the study, we have concluded that credit facilities should avail to the needy. Better transportation system should be there and cost of transportation should be less. Warehouse facilities for scientific storage of the fertilizers should provide to the various intermediaries so that the losses are to be reduced.

Keywords: *Jammu, obstacles, wholesalers, garrett ranking, credit, procurement and transportation.*

INTRODUCTION

Fertilizers have played an essential role in agricultural production, providing vital nutrients for FY crops and registering increasing demands over the years. As an agrarian country, India is home to numerous small and marginal farmers and is often plagued by low productivity and low quality. Crops are mainly rain-fed and cultivated on a single piece of land over time, decreasing soil fertility in many regions. Thereby, increasing quantities of nitrogen fertilizers have been used in the country. Because of this, the Indian government has brought about economic reforms and has ensured that fertilizers are available at affordable prices to increase productivity. Due to subsidy eligibility on notified fertilizers, the Indian fertilizer industry has been

able to provide enhanced food security for the country. As one of the country's eight core industries, fertilizer production has had positive growth since 2014 until 2021. India is among the largest consumers of fertilizers in the world, with domestic sales continually growing. However, the domestic production of urea was higher than the volume produced domestically. the share of imported urea has increased considerably in the past years. Apart from importing crude and manufactured fertilizers, the country is heavily dependent on importing raw materials such as rock phosphate, ammonia, and phosphoric acid. The value of India's fertilizer imports was estimated over 500 billion Indian rupees during fiscal year 2020. Indian Farmers Fertilizer Cooperative Limited (IFFCO), a multi-state cooperative society headquartered in the nation's capital, is the largest fertilizer manufacturer and marketer. With an annual installed capacity of over three million metric tons, National Fertilizers Limited, a state-owned corporation, is another of the largest producer of urea with a share of about 15 percent of total urea production in the country (www.statista.com). According to a report given by the IMARC group, the Indian fertilizer market size reached INR 898.5 Billion in 2022. It is expected that the market would reach at INR 1,188.3 Billion by 2028, exhibiting a growth rate (CAGR) of 4.85% during 2023-2028. It is estimated that the fertilizers in association with water can enhance output by about 70 per cent. Nearly 50 per cent of the increased food grain production in the last decade in the world comes from the balanced use of fertilizers (Borlaug, 1996 and Waghmode *et al.,* 2020). The actual production of all major fertilizers during the financial year 2020-21 and FY 2019-20 were 433.66 LMT and 425.92 LMT respectively. Its showing an increase of more than 1.8 percent in comparison of the previous year. The actual production of the major fertilizers during the year 2021-22 is 330.84 LMT. At present, there are 33 large size urea plants in the country, 21 units producing DAP and complex fertilizers and 2 units manufacturing Ammonium Sulphate as a by-product (Annual report, 2022).

MATERIALS AND METHODS

- **Locale of study**

The research was conducted with the help of schedule/ questionnaire based on the information collected from the respondents from Bishnah and R.S. Pura blocks of the Jammu district. 4 villages, 2 from each block was selected.

- **Sampling Techniques**

The study was based on convenience sampling technique and sampling technique to conduct the survey from the wholesalers, dealers, and farmers in Jammu.

- **Sample size**

The sample used in the study consists of the wholesalers, dealers and farmers from different areas of Jammu district. The primary data was collected through pre tested and well - structured schedule from the respondents. The sample size consisted of 5 wholesalers, 15 dealers, and 40 farmers in order to meet the objectives of the study.

- **Data collection**

The data collection is the method of collection of required information to keep on record for further use, to make important decisions about different issues and is of vital significance for others. The project included both the primary as well as the secondary data to meet the objectives of the study.

- **Primary Data**

Primary data regarding market channel, constraints and supply chain will be collected by personal interview method from the wholesalers, dealers/retailers and farmers of the respective fertilizer companies with the help of pre-tested

questionnaire or schedule.

- **Secondary Data**

The data will be collected through website journals related to advertisement, newspaper, magazines etc. Secondary data regarding market share of different fertilizer company and their distribution channels will be collected from the Department of Agriculture, Jammu.

- **Analytical tool used**

✓ Henry Garret ranking technique:

Henry Garrett ranking method is used in this study for identifying the problem being faced by the respondents. According to their preference or experience of the respondent they have ranked the constraints. By using the Garretts table, the percentage position is being converted into the scores. Then for each factors, the score of each individual are added. Afterward, the total and average value of the score is calculated and ranked as 1^{st}, 2^{nd}, 3^{rd} & so on up to the number of factors mentioned.

Formula:

Percentage position=100(Rij - 0.5)/N

Where,

Rij = rank position

N= number of items

RESULTS AND DISCUSSAION

The varied number of problems encountered by the wholesalers, dealers & farmers were found during study. Table 1. and Fig 1(a) reveals that the major problems that have been faced by the wholesalers in the procurement, supply and marketing of fertilizers were non-availability of credit facility in the purchase of fertilizers with an average percentage 64.20 (Rank 1) followed by Late receiving of fertilizers from the companies with average percentage 61.60(Rank 2), Storage problem with average percentage 60.80(Rank 3), lengthy procedure in procuring fertilizers (Average percentage 56.20, Rank 4) and so on. Lowest rank is given to the Packaging problem (Rank 9) and poor quality of fertilizers (Rank 10).

Table 1 : Ranking of the constraints faced by wholesalers

S. No.	Particulars	Total	Average Percentage	Rank
1.	Late receiving	308	61.6	2
2.	Packaging problem	194	38.8	9
3.	Storage problem	304	60.8	3
4.	Lack of availability of fertilizer	247	49.4	7
5.	Lengthy procedure in procurement	281	56.2	4
6.	Non-availability of credit facility	321	64.2	1
7.	Non-availability of required company	262	52.4	5
8.	Poor quality of fertilizers	101	20.2	10
9.	Transportation cost	254	50.8	6
10.	Delay in payments	218	43.6	8

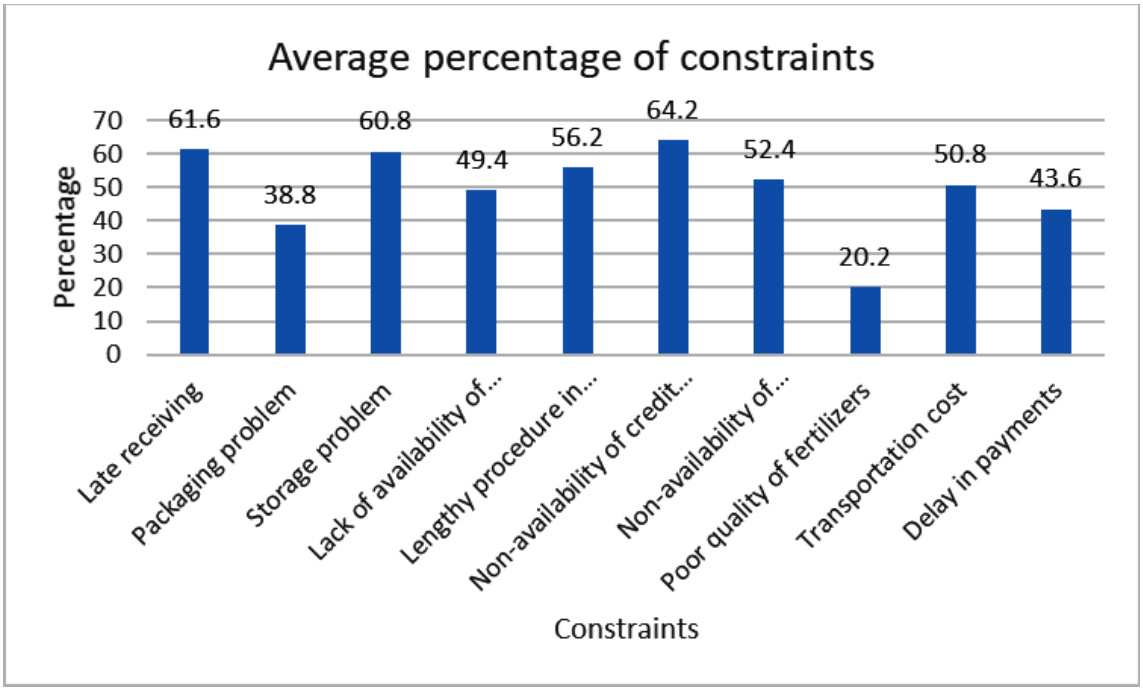

Figure 1(a) : Constraints faced by wholesalers

Table 2. & Figure 1(b) represents the constraints being faced by the dealers are represented with an average of 69.80 which are further categorized under various deferring factors i.e., Non- availability of credit facility followed by lengthy procedure in procurement (58.73), transportation charges are higher (58.06), storage problem (53.4), lack of availability of fertilizer (51.6), late delivery (50.8), lack of field information (49.13), Non-availability of required company (48.13), packaging problem (38.73), poor quality of fertilizer (19.6).

Table 2 : Ranking of the constraints faced by dealers

S.No.	Particulars	Total	Average Percentage	Ranks
1	Late delivery	762	50.8	6
2	Packaging problem	581	38.73	9
3	Storage problem	801	53.4	4
4	Lack of availability	774	51.6	5
5	Lengthy procedure in procurement	881	58.73	2
6	Non-availability of credit facility	1047	69.8	1
7	Lack of field work/information	737	49.13	7
8	Non-availability of required company	722	48.13	8
9	Poor quality of fertilizers	294	19.6	10
10	Transportation charges are higher	871	58.06	3

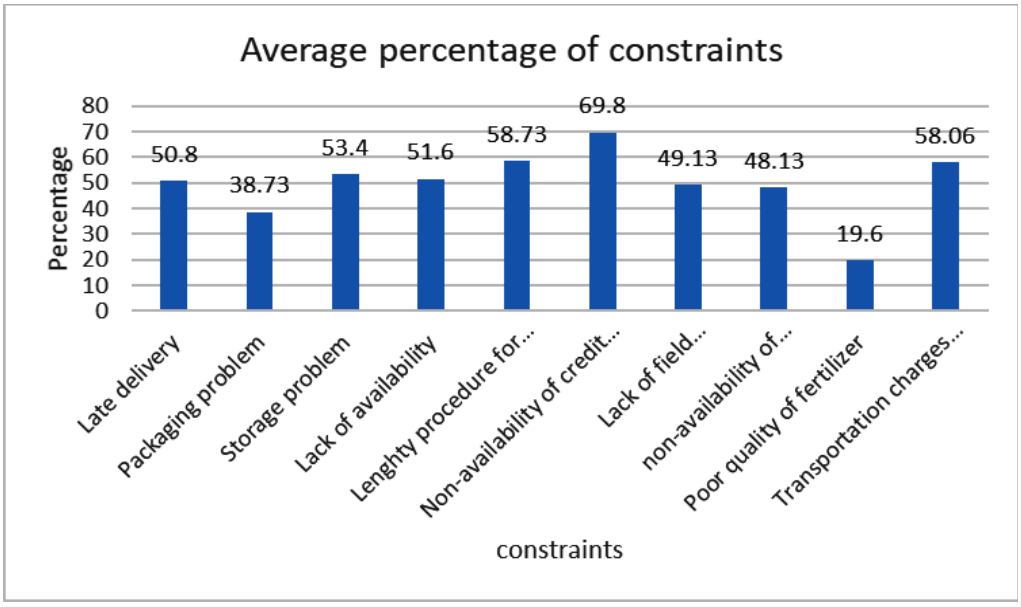

Figure 1(b). Constraints faced by dealers

Table 3. & figure 1(c) represents the constraints being faced by the farmers with an average value of 75.22 and categorized further into different factors i.e., Non- availability of credit facility followed by inadequate subsidy (73.95), transportation cost (60.6), storage problem (58.42), lengthy procedure in procurement (56.1), outlets are not within close proximity (51.35) lack of availability of desired company (51.2), price fluctuation (45.5), packaging problem (42.9), poor quality of fertilizer (37.32), late delivery (33.02), adverse climate condition (32.62), prices charged are higher than MRP (30.67).

Table 3 : Ranking of the constraints faced by farmers

S. No	Particulars	Total	Average percentage	Rank
1.	Prices charged are higher than MRP	1227	30.67	13
2.	Price fluctuation	1820	45.5	8
3.	Late delivery	1321	33.02	11
4.	Packaging problem	1716	42.9	9
5.	Storage problem	2337	58.42	4
6.	Lack of availability of desired company	2048	51.2	7
7.	Inadequate subsidy	2958	73.95	2
8.	Lengthy procedure in procurement	2244	56.1	5
9.	Non-availability of credit facility	3009	75.22	1
10.	Outlets are not within close proximity	2054	51.35	6
11.	Poor quality of fertilizers	1493	37.32	10
12.	Transportation cost	2424	60.6	3
13.	Adverse climate condition	1305	32.62	12

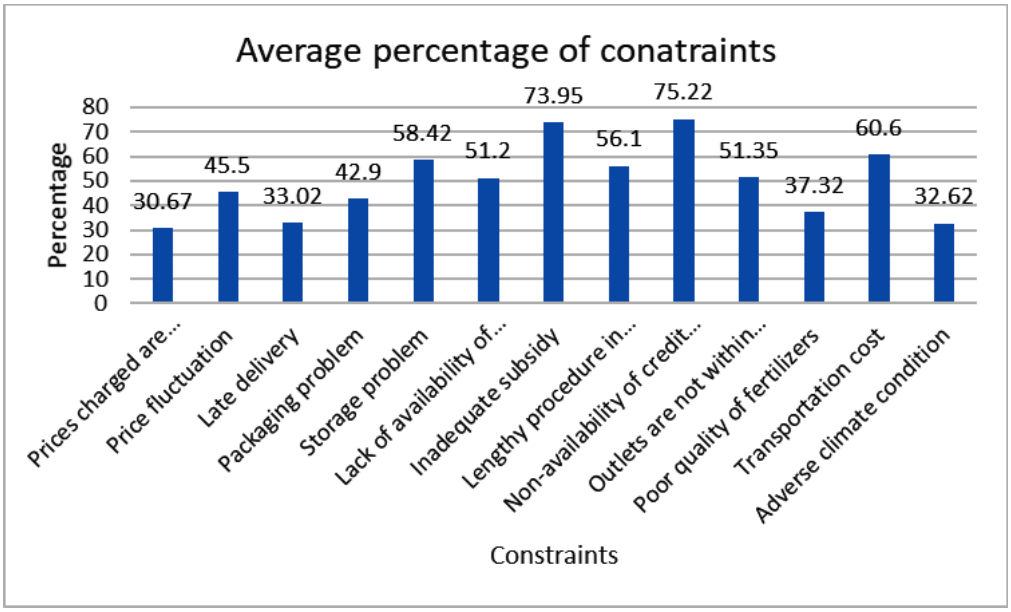

Figure 1(c) : Constraints faced by farmers

CONCLUSION

It has been seen in the study that the farmers mostly use to prefer the fertilizer of IFFCO company as it was easily available. Various problems have been faced by all the market intermediaries dealing with fertilizers. The major problem that being faced by all the respondents were ranked according to the ranks i.e., non-availability of the credit facility, lengthy procurement procedure, transportation costs, inadequate subsidy etc. These hurdles can be solved through strengthening the market infrastructure, proper marketing infrastructure. Proper subsidy should be given. Procurement procedure of fertilizers should be improvised so that less time has taken to procure. As fertilizer industry is growing with a rapid pace so the investment in this sector increases crop productivity as well as the employment to various people dealing in fertilizer market.

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Journal of Natural Resource and Development 19 (1) 13-18, 2024 | NAAS RATING : 4.23 | ISSN-0974-5033

AN ECONOMIC ANALYSIS OF ISABGOL CULTIVATION IN JALORE DISTRICT OF RAJASTHAN

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Received : 10.09.2023 Accepted : 05.12.2023

ABSTRACT

Isabgol (*Plantago ovata*) is an important cash crop in western Rajasthan during Rabi season. It is one of the most important medicinal crops grown for its husk. The study was carried out in Jalore district of Rajasthan for the period 2021-22. The primary data were collected from total 60 sample farmers that were selected through population to proportion method from Bhinmal and Sanchore tehsils. The study revealed that the total cost of cultivation was found to be Rs. 32423.00, of which 63.40 per cent were variable costs (Rs. 20568.50) and 36.60 per cent were fixed costs (Rs. 11854.50). On average, gross returns form Isabgol cultivation were estimated at Rs. 97027.10 /ha. The gross returns were highest on large farmer and lowest on small farmer. The average net returns from Isabgol cultivation was estimated at Rs. 64604.10 per hectare. On an average, a return per rupee was Rs. 3.00 per hectare. The return per rupees was found highest for large farmer and minimum for large farmer.

Keywords : *Isabgol, jalore, cost, gross return, net return, return per rupees.*

INTRODUCTION

India has a rich diversity of medicinal and aromatic plants; more than 8000 species of wild plants are known to be used in India for treatment of various health disorders (Chouhan and Sarawgi 2020). Isabgol (*Plantago ovata*) is an important cash crop in western Rajasthan during Rabi season. It is one of the most important medicinal crops grown for its husk. Mucilage yield amounts to approximately 25 per cent or more (by weight) of the total seed yield. Isabgol seed mucilage is often referred to as husk or phylum husk.Isabgol contains a significant amount of proteins and husk yields colloidal mucilage which are valued for medicinal application and used in aryuvedic, unani and allopathic systems of medicines. It is an annual herb and cultivated in Rajasthan, Gujarat, Madhya Pradesh and Haryana. Rajasthan is one of the main Isabgol producing states of India. The state ranks first in terms of area and production in the country (Jain 2014).

During the year 2021-22, Rajasthan has 362299 hectare area under Isabgol cultivation with 203647 MT productions. Barmer stands on first position in Rajasthan in respect to area (131355 hectare) and production (63639 MT). It was followed by Jaisalmer, Nagaur and Jalore. Jalore district have 40355 hectare area under Isabgol cultivation. It has 25907 MT production and 642 kg/

ha productivity.

The mucilage is used medicinally to treat conditions like constipation and digestive tract discomfort. After the husk is removed, the remaining seed material is used as animal feed. Isabgol grows well in warm temperate climates and needs chilly, dry weather for its crop season; as a result, it is typically sown in the winter. In western Rajasthan, it can be cultivated successfully as a Rabi crop in saline soils with poor water quality.It is excellent for these places since it requires less water than other crops.

Isabgol plant takes about 120 days to mature (November to March-April). The spikes are harvested when they turn red. The average yield of Isabgol comes to 800-1000 kg/ha. In the Rajasthan state largest area of western Rajasthan fall under Isabgol cultivation due to arid region and sandy loam soil.

MATERIALS AND METHODS

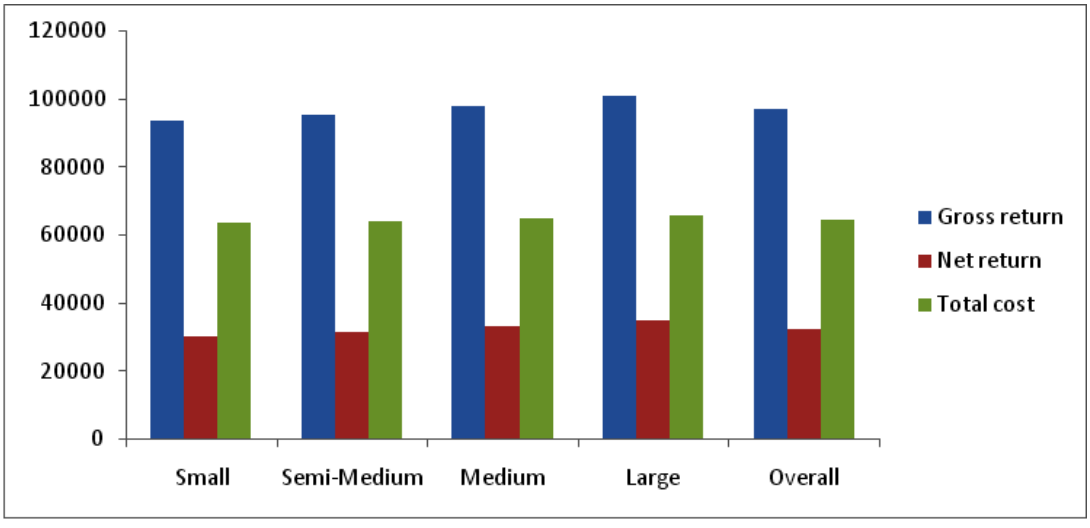
Jalore district of Rajasthan state was selected for the study; as this region covered more area under medicinal crop. Jalore district consist of nine tehsils, out of which two tehsil (Bhinmal and Sanchore) was selected on the basis of highest production of Isabgol. After then two villages from each selected tehsils were selected randomly, thus total four villages selected for the detailed study. In reference to respondent 60 farmers were selected by population to proportion method from the selected four villages. The cost of cultivation of Isabgol per hectare was finding out by using the cost concepts and the following costs and income measures: total costs, variable costs, fixed costs gross returns, net returns, returns per rupee of investment and cost of production.

RESULTS AND DISCUSSION

Estimation of cost of Isabgol cultivation by different farmer size group:

The total cost of cultivation was found to be Rs. 32423.00, of which 63.40 per cent were variable costs (Rs. 20568.50) and 36.60 per cent were fixed costs (Rs. 11854.50). It was found that machinery and manure was the major component of the working cost. The following key cost categories of the overall variable seeds, labour, fertilizers, irrigation charges, and plant protection chemicals accounted for 3.00, 8.60, 4.4, 12.10 and 1.1 per cent of the total cost of cultivation, respectively. From this, it can be inferred that farmer are interested in mechanization.

Fig. 1: Gross return, Total cost and Net return of Isabgol cultivation by different farmer size group.



Farm size group- wise, the total operational costs in cultivation of Isabgol per hectare were calculated to be Rs. 19869 on small, Rs. 20365 on semi-medium, Rs. 20412 on medium and Rs. 21628 on large farms. Thus, it was also observed that operational costs in the total cost were found to positive with the increase in the farm size holdings. The per hectare total fixed costs of Isabgol cultivation on small, semi-medium, medium and large farms were estimated as Rs. 10229, Rs. 11038, Rs. 12764 and Rs. 13387, respectively. The share of fixed costs in total cost was also found to positive with the increase in the size of operational holdings.

Cost groups in Isabgol cultivation:

This cost group indicates that, on an average, cost A_1 in cultivation of Isabgol was Rs. 21094/ha in the study area. Among the farm size groups, cost A_1 was estimated to be Rs. 19567, Rs. 20369, Rs. 21275 and Rs. 23163 per hectare on small, semi-medium, medium and large farmer, respectively. Cost A_2 was just equal to cost A_1 because of none of the farmer had taken land on rent for Isabgol cultivation in the study region.

Table 1 : Cost groups in Isabgol cultivation in different farm size.

S.N.	Cost Item	Small	Semi-Medium	Medium	Large	Overall
1	**Cost A_1**	19567	20369	21275	23163	21094
2	**Cost A_2**	19567	20369	21275	23163	21094
3	**Cost B_1**	19820	20658	21590	23549	21404
4	**Cost B_2**	28576	29783	31488	33594	30860
5	**Cost C_1**	21342	22278	23278	24970	22967
6	**Cost C_2**	30098	31403	33176	35015	32423
7	**Cost C_3**	33107.8	34543.3	36493.6	38516.5	35665

Among different size group of farms, cost C_1 on small, semi- medium, medium and large farms was estimated at Rs. 21342, Rs. 22278, Rs. 23278 and Rs. 24970 per hectare respectively, with an overall average of Rs. 22967/ha. Further, the Cost C_2 was calculated as Rs. 30098 for small, Rs. 31403 for semi-medium, Rs. 33176 for medium and Rs. 35015 for large farmer. Cost C_3 include management cost, which is cost C_2 with 10 per cent of cost C_2. Cost C_3 was on an average Rs. 35665/ha. Cost C_3 was estimated to be Rs. 33107.80, Rs. 34543.30, Rs. 36493.60 and Rs. 38516.50 per hectare on small, semi-medium, medium and large farmer, respectively.

Returns from the Isabgol cultivation:

The return presents that per hectare production of main product on small, semi-medium, medium and large farmer was 7.20, 7.35, 7.56 and 7.79 quintal per hectare respectively. The overall yield realized from Isabgol cultivation was 7.48 quintal/ha. Production of by product on small, semi-medium, medium and large farmer was 13.32, 13.39, 13.90 and 14.03 quintal/ha. The overall production of by product realized from Isabgol cultivation was 13.66 quintal/ha. in the study area. Among the different farm size categories, the gross returns were calculated as Rs. 93589.20, Rs. 95370.90, Rs. 98199.00 and Rs. 100949.30 per hectare on small, semi-medium, medium and large farmer, respectively. On average, gross returns form

Isabgol cultivation were estimated at Rs. 97027.10 /ha. The gross returns were highest on large farmer and lowest on small farmer.

Table 2 : Returns from Isabgol cultivation on different farm size groups.

S. No.	Item	Small	Semi medium	Medium	Large	Overall
1	**Production of main product/ha. (in qtl)**	7.2	7.35	7.56	7.79	7.48
2	**Production of by product/ha. (in qtl)**	13.32	13.39	13.9	14.03	13.66
3	**Production in qtl/ha.**	20.52	20.74	21.46	21.82	21.14
4	**Value of main product/ha. (in rupees)**	82800	84525	86940	89585	85962.5
5	**Value of by product/ha. (in rupees)**	10789.2	10845.9	11259	11364.3	11064.6
6	**Gross Return/ha. (in rupees)**	93589.2	95370.9	98199	100949.3	97027.1
7	**Total cost (C2) (in rupees)**	30098	31403	33176	35015	32423
8	**Net Return (in rupees)**	63491.2	63967.9	65023	65934.3	64604.1
9	**Cost of production/qtl (in rupees)**	4180.28	4272.52	4388.36	4494.87	4334
10	**Farm Business Income (in rupees)**	74022.2	75001.9	76924	77786.3	75933.6
11	**Family Labour Income (in rupees)**	65013.2	65587.9	66711	67355.3	66166.85
12	**Return Per Rupees**	3.11	3.04	2.96	2.88	3.0

The cost of main product production per quintal was Rs. 4180.28, Rs. 4272.52, Rs. 4388.36 and Rs. 4494.87 on small, semi-medium, medium and large farmer respectively. The overall cost of production of Isabgol was Rs. 4334.00 per quintal. The average net returns from Isabgol cultivation were estimated at Rs. 64604.10 per hectare. Net returns were calculated as Rs. 63491.20/ha on small farmer, Rs. 63967.90/ha on semi-medium farmer, Rs. 65023.00/ha on medium farmer and Rs. 65934.30/ha on large farmer.

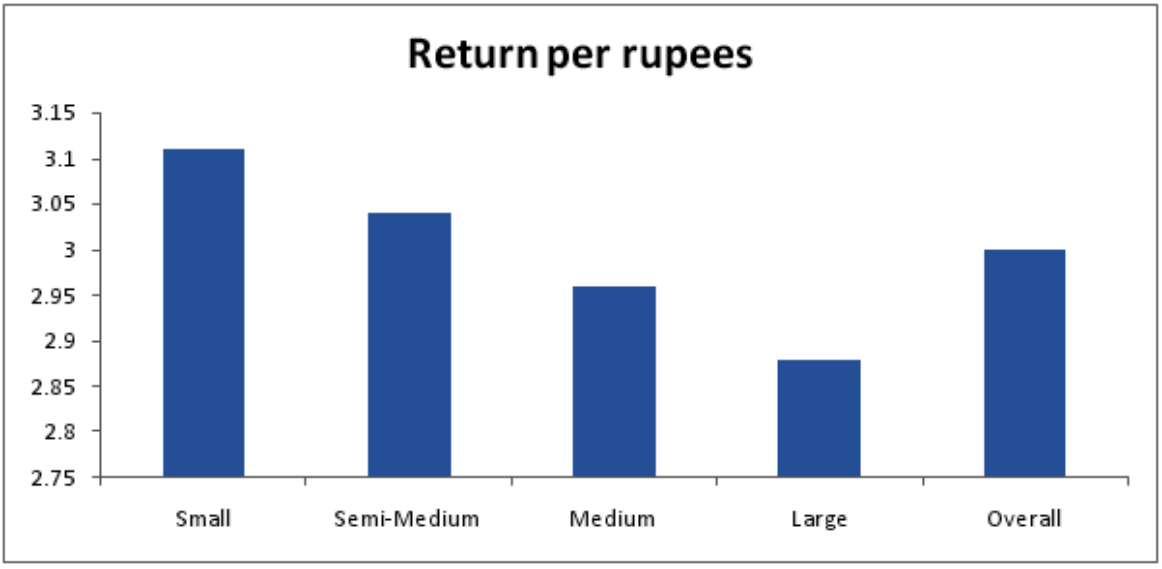


Fig. 2 : Return per rupees of Isabgol cultivation.

The returns per rupees were calculated as Rs. 3.11, Rs. 3.04, Rs. 2.96 and Rs. 2.88 on small, semi-medium, medium and large sized farmer respectively. On an average, returns per rupee were Rs. 3.00 per hectare.

Conclusion and Findings

The study concludes that Isabgol is the most important cultivating medicinal crop in the western Rajasthan. Barmer district of Rajasthan stands on first position in cultivation of Isabgol. Study area was Jalore district of Rajasthan that has fourth position in respect to area under Isabgol cultivation. In the study area the total cost of Isabgol cultivation was found to be Rs. 32423.00, of which 63.40 per cent were variable costs (Rs. 20568.50) and 36.60 per cent were fixed costs (Rs. 11854.50). On average, gross returns form Isabgol cultivation were estimated at Rs. 97027.10 /ha. The gross returns were highest on large farmer and lowest on small farmer. The average net returns from Isabgol cultivation were estimated at Rs. 64604.10 per hectare. The average net return was highest for large farmer and lowest for small farmer. But due to cost of production of per quintal Isabgol was highest for large farmer and lowest for small farmer, the return per rupees was highest for small farmer and lowest for large farmer. On an average, returns per rupee were Rs. 3.00 per hectare.

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Journal of Natural Resource and Development 19 (1) 18-27, 2024 | NAAS RATING : 4.23 | ISSN-0974-5033

IMPACT STUDY ON SOIL TEST BASED NUTRIENTS APPLICATION IN DIFFERENT CROPPING SYSTEM

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Received : 11.10.2023 Accepted : 05.01.2024

ABSTRACT

The present study was conducted in block Kalakankar district Pratapgarh (U.P.) under various cropping systems during 2019-2020 to assess the efficacy of the plant nutrients by Krishi Vigyan Kendra. The ideal ratio of the major nutrients that is, Nitrogen (N), Phosphorous (P) and Potassium (K) should be 4:2:1 whereas in this block it had reached a threatening level of 8:2:1 and less or no application of secondary and micro nutrients. The farmers are applying the imbalance nutrients which are costing higher, however with the same budget balance dose of nutrients applied have produced high yield. The results behind that limited changes in cost of cultivation. Whereas, the critical yield gap value Rs.17600 per ha in rice & wheat, Rs.20,000 per ha in vegetables, Rs.39,000 per ha in potato and Rs.80,000 per ha in mango orchard was observed under these cropping system. The total area of block kalakankar are 23341 ha, in which Rice (7450 ha), Wheat (8240 ha), Vegetable (1542 ha), Potato (2435 ha) and Mango orchards (3580 ha) on according to district data. As a result of the excessive and imbalanced use of fertilizers, the total saving in cost of cultivation Rs. 4,04,58,735 in farmer's practices, while there is a loss of Rs. 68,83,49,000 was calculated on based of critical gap through input and yield. The total cost of cultivation increased 11.16 percent by SHC, while the total net profit increased up to 24.44 percent from Rice & wheat, 27.66 percent from Potato crop, 11.90 percent from vegetables and 33.34 percent from mango orchards was studied under cropping system of kalakankar block of district Pratapgarh (U.P.).

Keywords : *Cropping system, nutrients, recommended dose, rice, soil health card and sustainable agriculture.*

INTRODUCTION

Soil Health Card (SHC) is a Government of India's scheme promoted by the Department of Agriculture & Co-operation under the Ministry of Agriculture and Farmers' Welfare. India has a large farming population, yet many of them are unaware of the best crops to produce for optimal production. In essence, they are ignorant about the kind and quality of their land. They may have firsthand knowledge of which crops thrive and which ones don't. However, they are unsure of how to better the state of the soil. The national soil health card system, which has completed its seventh year of operation, has brought new awareness to the importance of a green economy. Plants need nourishment to facilitate their growth and maturation. The plant nutrients facilitated by the use of soil minerals and organic matter present in the soil, as well as through

the application of organic or inorganic fertilizers. In order for plants to effectively use these nutrients, it is essential that they be provided with sufficient amounts of light, heat, and water. The phenomenon of excessive nutrient intake might lead to sub-optimal development due to the presence of hazardous elements. Hence, it is crucial to ensure the appropriate quantity and distribution of nutrients throughout the application process. The evaluation of SHC's effect was conducted using specific metrics such as ecological, biological, financial, and yield values. Among the analyzed instances, the most notable common results are:

- The implementation of balanced fertilizer application has been facilitated.
- The outcome of this initiative led to a decrease in the expenses associated with agriculture, resulting in an increase in the revenue of farmers.
- The use of fertilizers saw a decrease.
- The returns on each rupee invested have increased.

MATERIALS AND METHODS

The study was carried out in block kalakankar districts Pratapgarh, of state U.P., in these 54 villages selected for study purpose, in which mostly four type cropping system dominants *viz.* Cereals (Rice- Wheat cropping system), Potato, Vegetables and Mango orchard. Further whole village farmers were selected among these categories. Cropland area was split into 2.50 ha irrigated and 10.00 ha rain fed grids under the SHC program. One soil sample from each 2.50 ha area of grids will be taken, because of block kalakankar comes under irrigated farming situation. The findings of the soil test will be sent to each farmer whose property is covered by the grid and suggested recommended dose of primary, secondary and micro-nutrients on the basis of soil test report. Soil samples collected and analysis the soil sample in KVK soil testing laboratory.

Physicochemical Properties of Surface Soil

Physical parameters of soil, ph value of selected soil samples were analysed with the ph meter scale, whereas Electric Conductivity (dsm-^{1}at 25^{0}C) measured by EC meter. Organic carbon (%) in soil measured by walkley and black's rapid titration method, whereas the nitrogen in soil (kg/ha) analysed by alkaline per magnate method. Secondary and micro-nutrients, sulphur (mg/kg), Zink (Zn), Ferrous (Fe), Copper (Cu), Manganese (Mn), Boron (B) (ppm) analyzed to DTPA extraction method by Mridaparikshak machine IISR, Bhopal

Table 1: Whole block's average data of physicochemical properties in surface soils under different villages of block Kalaknakar in district Pratapgarh.

Sl. No.	Ph	EC (dSm-1)	OC (%)	N (kgha-1)	P (kgha-1)	K (kgha-1)	Available S (mg/kg)	Available Zn (mg/kg)	Available Fe (mg/kg)	Available Cu (mg/kg)	Available Mn (mg/kg)	Available Bo (mg/kg)
Range	8.60-8.20	0.430-0.380	0.31-0.38	163.20-172.70	14.26-17.84	168.10-188.78	6.34-8.40	0.48-0.68	7.84-7.28	8.40-5.80	4.50-5.20	1.06-0.98
Mean	8.40	0.405	0.345	167.95	16.05	178.44	7.37	0.58	7.56	7.10	4.85	1.02
SD±	0.283	0.035	0.049	6.718	2.531	14.623	1.457	0.141	0.396	1.838	0.495	0.057
CV	3.36	8.730	14.34	4.000	15.772	8.195	19.76	24.38	5.238	25.89	10.20	5.54

RESULTS AND DISCUSSION

Keeping in view the importance of SHC scheme the present study was undertaken to examine the awareness, level of adoption and impact of application of recommended doses of fertilizers on soil test basis and its impact on income of major crops in Pratapgarh (U.P.). The results of the study revealed that the category of soil-tested farmers was younger and mainly used more nitrogen-rich fertilizers but less phosphorus and potassium fertilizers in the rice, wheat, potato, vegetables and mango orchard in their farms compared to soil health card recommendations. Regarding application of organic fertilizers, some farmers used only FYM in their fields. The main problems faced by the respondents in implementing the SHC system were; less organization of camps for soil testing, difficulty in understanding and delay in submission of soil test reports.

Critical Fertilizer Input Gap in Cereal (Rice-Wheat) Crops

The cost of cultivation and income of rice-wheat for the farmers have been presented in table no.2. From the table it is seen that the quantity and cost of most of the fertilizers input are marginally in differences for the soil tested practices as compared to previous time practices except the rental value of the land. In this study total 15 villages selected, which were divided in 271 grids and distributed total 2547 soil health cards.

Table 2 : Critical input gap in cereal (Rice-Wheat) crops

S No	Elements	Status of soil test report	Recommended dose(kg) &Value(Rs.)		Existing dose (Kg)& value (Rs.)		Critical Nutrients gap (Kg)	Critical Nutrients gap (Rs.)
			Kg	Rs	Kg	Rs		
1	**N**	Low	120	1848	160	2464	+40	+616
2	**P**	Low	60	2904	40	1936	-20	-968
3	**K**	Medium	40	544	10	136	-30	-408
4	**Zn**	Low	20	1300	10	350	-10	-650
5	**S**	Medium	10	400	0	0	-10	-400
6	**Fe**	Medium	10	250	0	0	-10	-250
	Yield		**Total** 56Q/ha @ Rs.1600/Q	**7246 Rs.** 89600 Rs.	45 Q/ha @ Rs.1600/Q	**5186 Rs.** 72000 Rs.	17600 Rs.	**-2060 Rs.**
Cost of Recommended Dose in Rs. /ha. = 7,246.00 Cost of Existing Dose in Rs./ha. = 5,186.00 Critical input gap in Rs./ha. = - 2,060.00 Critical yield gap in Rs./ha. = 17,600.00								

It is clear above table that 160 kg nitrogen (N_2) per ha which is 33 percent higher than recommended dose 120 kg/ha, whereas phosphorous (P_2O_5) is applied 40 kg/ha that is 33 percent less than recommended dose @ 60 kg/ha and in case of potassium (K_2O) applied @ 10 kg/ha against recommended dose of 40 kg/ha that is only 25 percent of recommended dose is applied by the

farmer. It was also observed that Zinc only 50 percent applied. There was 100 percent shorting of applying of sulphur and iron in cereals crops.

The total costs of fertilizers for cereals crop per ha were calculated at Rs. 7,246 in recommended dose and Rs. 5,186 for farmers practices. On the return part, per ha yield 56 quintals for soil tested farmers was marginally higher i.e. 11 quintal valued at Rs. 17600 than the yield of the farmers practices (46 quintals). Since none of the sample farmers adopted the recommended RDF fertilizer dose, the effect of application of recommended fertilizer doses on yield and observed changes could not be identified and included in the report. There was slight decline in chemical fertilizer usage especially N and P and increase in K with micronutrients usage in case of paddy- wheat cropping system. This may not be because of the proper application of fertilizer, as there was not such a significant difference. It could also be because of some other external factors. The impact of any development scheme can only be evaluated when it is implemented in the field. Since the farmers in our sample area received their SOIL Health Cards a little late and were not able to switch to the RDF yet, proper assessment of the scheme is not possible.

Critical fertilizer input gap in potato crop

The cost of cultivation and income of potato crop for the recommended dose have been presented in table no.3. It is seen that the quantity and cost of Fertilizers input are marginally in differences for the soil tested practices as compared to previous time practices. In this study we have selected 13 villages, which divided in 182 grids and collected 1617 soil sample.

Table 3 : Critical input gap in potato

S No	*Elements*	*Status of soil test report*	*Recommended dose(kg) &Value(Rs.)*		*Existing dose (Kg)& value (Rs.)*		*Critical Nutrients gap (Kg/ha)*	*Critical Nutrients gap (Rs.)*
			Kg	Rs	Kg	Rs		
1	**N**	Low	150	2310	200	3080	+50	+770
2	**P**	Low	80	3872	160	7744	+80	+3872
3	**K**	Medium	100	1360	60	816	-40	-544
4	**Zn**	Low	25	1625	10	650	-15	-975
5	**S**	Medium	20	800	0	0	-20	-800
6	**Fe**	Medium	20	500	0	0	-20	-500
	Yield		**Total** 300Q/ha @ Rs.600/Q	**10467 Rs.** 180000 Rs.	235 Q/ha @ Rs.600/Q	**12290 Rs.** 141000 Rs.	39000 Rs.	**+1823 Rs.**

Cost of Recommended Dose in Rs. /ha.	= 10467.00
Cost of Existing Dose in Rs./ha.	= 12290.00
Critical input gap in Rs./ha.	= + 1823.00
Critical yield gap in Rs./ha.	= 39000.00

It is vivid from the data displayed in the table that growing of potato crop, the nitrogenous fertilizers applying 33 percent additionally compared to recommended dose. In case of Phosphoric fertilizers applying double dose and 40 percent minimum supplying of potassium fertilizers. Total 60 percent amount of zink and 100 percent no applying of sulphur & iron in micro nutrients. The impact of soil testing on the economics of cultivation of potato crop was studied. In potato the total cost of cultivation decreased by 17.41 percent by balanced dose of fertilizers, which was converted in Rs. 1823 per ha, but net income also increases by 27.65 per cent from Rs. 1,41,000 to 1,80,000 per ha. On the return part, yield 300 quintals per ha for soil tested based farmers was marginally higher *i.e.* 27.65 percent, valued at Rs. 39,000 than the yield of the farmers practices (235 quintals).

Critical input gap in Vegetable

The cost of cultivation and income of vegetable for farmers have been presented in table no.4. From the table it is seen that the quantity and cost of fertilizers input are marginally in differences for the soil tested practices according to soil test reports as compared to previous time practices. Under this faming system 13 villages were selected in which divided in 223 grids and 2045 soil sample & soil health cards.

Table 4 : Critical input gap in vegetable

S No	*Elements*	*Status of soil test report*	*Recommended dose(kg) &Value(Rs.)*		*Existing dose (Kg)& value (Rs.)*		*Critical Nutrients gap (Kg/ha)*	*Critical Nutrients gap (Rs.)*
			Kg	Rs	Kg	Rs		
1	**N**	Low	150	2310	180	2772	+30	+462
2	**P**	Low	80	3872	120	5808	+40	+1936
3	**K**	Medium	50	680	20	272	-30	-408
4	**Zn**	Low	20	1300	10	650	-10	-650
5	**S**	Medium	10	400	0	0	-10	-400
6	**Fe**	Medium	10	250	0	0	-10	-250
7	**B**	Medium	5	200	0	0	-5	-200
	Yield		**Total** 265Q/ha @ Rs.800/ Q	**9012 Rs.** 1,88,000 Rs.	210 Q/ha @ Rs.800/ Q	**9502 Rs.** 1,68,000 Rs.	20,000 Rs.	**+490 Rs.**
Cost of Recommended Dose in Rs. /ha. = 9012.00								
Cost of Existing Dose in Rs./ha. = 9502.00								
Critical input gap in Rs./ha. = + 490.00								
Critical yield gap in Rs./ha. = 20,000.00								

The impact of soil testing on the economics of cultivation of vegetables was studied, in which the total cost of cultivation decreased in only fertilizers special was 5.43 percent by balanced doses of fertilizers. Those are converted in Rs. 490 per ha, while the net income also increases by 11.90 percent from Rs. 1,68,000 to 1,88,000 per ha. On the return part yield of vegetables 256 quintals per ha on soil tested based farmers was marginally higher *i.e.* 21.90 quintal/ha, valued at Rs. 20,000 than the yield

of the previous farmers practices (210 quintals/ha).

Critical input gap in mango orchard

The cost of cultivation especially fertilizers and income for mango orchards of farmers have been presented in table no.5. Its data showed that the quantity and cost of fertilizers input are marginally in differences for the soil test reports based practices as compared to previous practices. In mango orchards situation total 13 villages were selected in which 207 grids and 1972 soil health cards provided to farmers.

Table 5 : Critical input gap in mango orchard

S No	*Elements*	*Status of soil test report*	*Recommended dose(kg) &Value(Rs.)*		*Existing dose (Kg)& value (Rs.)*		*Critical Nutrients gap (Kg/ha)*	*Critical Nutrients gap (Rs.)*
			Kg	Rs	Kg	Rs		
1	**N**	Low	100	1540	50	770	-50	-770
2	**P**	Low	75	3630	50	2420	-25	-1210
3	**K**	Medium	50	680	10	136	-40	-544
4	**Micro Nutrients Mixture**	Low	50	2000	20	800	-30	-1200
	Yield		**Total** 160 Q/ha @ Rs.2000/Q	**7850 Rs.** 3,20,000 Rs.	120Q/ha @ Rs.2000/Q	**4126 Rs.** 2,40,000 Rs.	80,000 Rs.	**-3724 Rs.**
Cost of Recommended Dose in Rs. /ha. = 7850.00								
Cost of Existing Dose in Rs./ha. = -4126.00								
Critical input gap in Rs./ha. = -3724.00								
Critical yield gap in Rs./ha. = 80,000.00								

It is clear from the data that the level of nitrogen is less than 50 percent whereas phosphorous is 33 percent less uses and 80 percent less using of potash. In micro-nutrients only 40 percent utilized in mango orchard. Consequently, a research endeavour was initiated to assess the impact on the knowledge level pertaining to soil health management (SHM) among farmers who benefited from it. Additionally, the study aimed to gauge the degree to which beneficiary farmers adopted the recommendations of soil health cards (SHC) as well as identify the variables that influenced their acceptance of these recommendations.

A study was conducted to examine the influence of soil testing on the economic aspects of cultivating a mango orchard. The findings revealed that the overall cost of cultivation enhanced by 1.50 percent just via the use of a balanced dosage of fertilizers, as determined by soil testing. The conversion rate for those was adjusted to Rs. 3724 per ha, resulting in a net revenue rise of 33.33 percent from Rs. 2,40,000 to Rs. 3,20,000 per ha. In terms of the return aspect, the average yield per

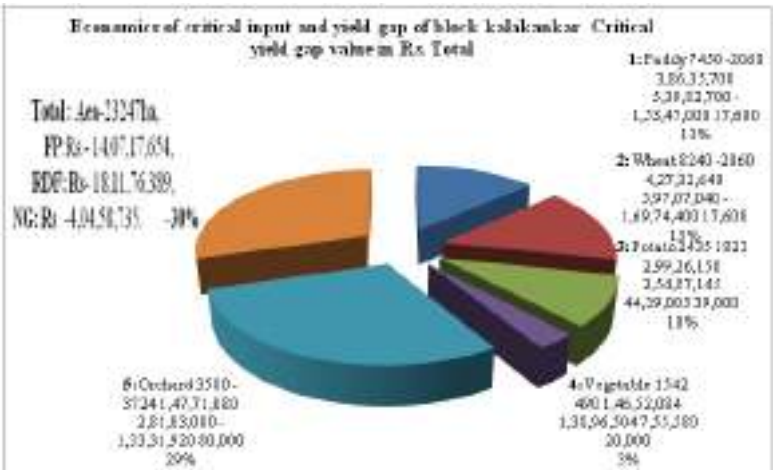
hectare for farmers who used soil testing was somewhat higher, namely 160 quintals. This yield was 20 quintals more than the yield achieved by earlier farming techniques, which amounted to 120 quintals. The value of the increased production was estimated at Rs. 80,000 additionally.

Combined economic study of critical input and yield gap

By using soil health cards, farmers may save cultivation costs and boost crop yields by applying the balanced dose of fertilizer to the site specific, hence improving nutrient management. The total area of block kalakankar are 23341 ha, in which rice (7450 ha), Wheat (8240 ha), vegetables (1542 ha), potato (2435 ha) and mango orchards (3580 ha) area was calculated. The supply of SHC is required every three years. Following the implementation of the SHC plan, farmers' net income increased. It is inadvertently promoting sustainable agriculture and preserving the fertility and health of the soil. Despite these shortcomings, soil health certificates are nevertheless very helpful to farmers. An integrated strategy that includes techniques like lowering tillage, preventing soil compaction, cultivating cover crops, improving crop rotations, adding organic and inorganic fertilizers, and more should be used to preserve the health and condition of the soil.

Table 6 : Economics of critical input and yield gap of block kalakankar District Pratapgarh (U.P.)

Economics of critical input and yield gap of block kalakankar								
S. No.	**Cropping system**	**Area (ha.)**	**Critical Nutrients Gap cost of R.D.F. /ha.**	**Cost of existing practices**	**Cost of R.D.F practices**	**Total Nutrients Gap in Rs.**	**Critical yield gap value in Rs.**	
							Per ha.	**Total**
1	Paddy	7450	-2060	3,86,35,700	5,39,82,700	-1,53,47,000	17,600	13,11,20,000
2	Wheat	8240	-2060	4,27,32,640	5,97,07,040	-1,69,74,400	17,600	14,50,24,000
3	Potato	2435	1823	2,99,26,150	2,54,87,145	44,39,005	39,000	9,49,65,000
4	Vegetable	1542	490	1,46,52,084	1,38,96,504	7,55,580	20,000	3,08,40,000
5	Orchard	3580	-3724	1,47,71,080	2,81,03,000	-1,33,31,920	80,000	28,64,00,000
	Total	**23247**		**14,07,17,654**	**18,11,76,389**	**-4,04,58,735**		**68,83,49,000**



The impact of soil testing on the economics of cultivation of selected four type cropping system (Rice-wheat, potato, vegetables and mango orchards) was studied. In cereals (Rice- wheat cropping system) the total cost of cultivation increased by 39.72 percent, net income also increases by 24.44 percent (Rs 17600). In potato the total cost of cultivation in fertilizer parts decreased by 17.41 percent by balanced dose of fertilizers, which was converted in Rs. 1823 per ha, while the net income also increases by 27.65 per cent from Rs. 1,41,000 to 1,80,000 per ha. On the return part, per ha yield 300 quintals for soil tested based farmers was marginally higher, valued at Rs. 39,000 than the yield of the farmers practices (235 quintals/ha).

The total cost of cultivation decreased in specially fertilizers in vegetables was 5.43 percent by balanced dose of fertilizers. Those have converted in Rs. 490 per ha, but net income also increases by 11.90 percent from Rs. 1,68,000 to 1,88,000 per ha. On the return part, per ha yield 256 quintals for soil tested based farmers was marginally higher *i.e.*21.90 quintal/ha valued at Rs. 20,000 than the yield of the previous farmers practices (210 quintals/ha).Whereas the findings of mango orchard revealed that the overall cost of cultivation increased 1.50 percent just via the use of a balanced dosage of fertilizers, but the conversion rate for those was adjusted to Rs. 3724 per ha, resulting in a net revenue rise of 33.33 percent from Rs. 2,40,000 to Rs. 3,20,000 per ha. In terms of the return aspect, the average yield per hectare for farmers who used soil testing was somewhat higher, namely 160 quintals. This yield was 20 quintals more than the yield achieved by earlier farming techniques, which amounted to 120 quintals. Additionally, the value of the increased production was estimated at Rs. 80,000.

Impact of the SHC Scheme and Utilization Level

- Approximately 66% of farmers are able to comprehend the SHC's content, 57% say the suggestions are appropriate for their farms, and 53% are able to implement the recommendations.
- The SHC program is all-inclusive, and small and marginal farmers take the initiative to implement its suggestions.
- In some states, the amount of urea and DAP used in cotton and paddy was reduced by 20 to 30%, which lowered the cost of cultivation. The amount that was saved on cultivation costs per acre varied from Rs. 1000 to Rs. 4000.
- Following the distribution of SHC, there was a modest rise in the usage of micro-nutrients, particularly gypsum.
- Farmers who followed the SHC's suggested measures saw a significant boost in production.
- Following the implementation of the SHC plan, farmers' net earnings improved by 30 to 40% due to a drop in cultivation costs and an increase in yields.

Soil Health Card Scheme's limitations

- The Farmers Expressed Dissatisfaction about the Soil Test Results not being indicative of their farms and the lack of soil sample collection by field employees done without their consent. In order to foster confidence, samples must be gathered with GRID farmers present.
- Consistent soil examination GRIDS of 2.50 ha for irrigated farming and 10.0 ha for rainfed farming need to be re-evaluated. The GPS data should be used to calculate the grid size.
- To ascertain the grid size at the block level, a soil variogram must be created at each block level.
- Many farmers are unable to comprehend the information and, as a result, are unable to adhere to the advised methods.

- Before the planting season, SHC distribution and awareness efforts must be organized to encourage farmers to use the suggested fertilizers and crops.
- It is necessary to plan awareness programs on the use of SHC to boost yields while reducing fertilizer prices and use.
- Some farmers believe that one or two physical and microbiological markers (such soil texture, water holding capacity, water quality, and bacterial concentration) should be included in the SHC.

CONCLUSION

The study has concluded that, the critical yield gap in rice and wheat Rs.17,600 per ha, Rs.39,000 per ha in potato, Rs. 20,000 per ha in vegetables, and Rs.80,000 per ha in mango orchard. Due to the overuse and uneven use of fertilizers, the total saving in cost of cultivation Rs. 4,04,58,735 by farmers but losses in their yield in value Rs. 68,83,49,000 calculated based on `critical in put and yield gap. The total cost of cultivation increased 11.16 percent by SHC, whereas the total net profit increased up to 24.44 percent from Rice & wheat, 27.66 percent from Potato crop 11.90 percent, from vegetables and 33.34 percent from mango orchards.

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Journal of Natural Resource and Development 19 (1) 28-33, 2024 | NAAS RATING : 4.23 | ISSN-0974-5033

EFFECT OF PUMPKIN FLOUR ON PHYSICAL AND CHEMICAL CHARACTERISTICS OF CRACKERS DURING STORAGE

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Received : 18.11.2023 Accepted : 22.12.2023

ABSTRACT

Effect of pumpkin flour on the physical and chemical characteristics of crackers during storage was studied by incorporating pumpkin flour at different concentrations from 5-25% based on refined wheat flour. Addition of 15% of pumpkin flour was found to be optimum for cracker preparation. Crackers were prepared by blending refined wheat flour and pumpkin flour in various ratios *i.e.* 100:0, 95:5, 90:10, 85:15, 80:20 and 75:25, respectively. Prepared crackers were packed in polypropylene bags and stored at room temperature and subjected to physico-chemical characteristics at an interval of one month for a period of three months. The highest weight and thickness of 5.60 g and 4.10 mm in treatment T_6 (75:25:: Refined wheat flour: pumpkin flour) whereas lowest in T_1 (100:0:: Refined wheat flour: pumpkin flour) having values of 4.12 g and 3.50 mm, respectively. With the advancement of storage, there was a general decreasing trend was observed in reducing and total sugar.

Keywords: *Refined flour, pumpkin flour, blended, crack*ers

INTRODUCTION

Pumpkins from genus Cucurbita of the family Cucurbitaceae which includes squash and cucumbers are grown throughout the tropical and sub tropical countries. There are three common types of pumpkin world-wide, namely Curcurbita pepo, Curcurbita maxima and C. moschata (Lee *et al.*, 2003)**.** The yellow-orange characteristic colour of pumpkin is due to the presence of carotenoids. Carotenoids, which are natural pigments responsible for the yellow, orange and red colour of many foods, are intensely investigated mainly because of their health promoting effects. Pumpkin provides a valuable source of carotenoids and ascorbic acid which have major roles in nutrition as provitamin A and as an antioxidant respectively. Current research indicates that a diet rich in foods containing beta-carotene may reduce the risk of developing certain types of cancer and offers protection against heart disease (See *et al.,* 2007). Cucurbita moschata is generally eaten as vegetable and is cultivated for its young shoots, flesh, edible flowers and fruit (Muzzaffar *et al.,* 2016 and Choudhary *et al*. 2021). In India, pumpkins are grown on approximately 1,06,000 hectares with a production of 2,20,500 metric tonnes. However, the area under pumpkin cultivation in Jammu district of J&K UT is 570 hectares with an annual production of 13,940 tonnes (Anonymos, 2021).

In India, baking Industry is considered as

one of the major segments of food processing sector. Baked products in the form of biscuits and cookies are gaining popularity as they offer certain advantages like availability, ready to eat convenience, cheaper than conventional snack items, availability in varieties and shelf life (Crassina, 2012). With the changing life style, consumers demands foods with multiple health benefits resulting in the developments of new processing technologies in food nutrition science. The present day scenario demands using of novel ingredients in commonly consumed foods rather than developing new products to improve the functional characteristics (Aleem, 2012). Though literature is available on the development of various bakery products using pumpkin flour but literature is scanty on the use of pumpkin flour in the preparation of crackers.

MATERIALS AND METHODS

The refined wheat flour and pumpkin flour were blended with each other in different concentrations for developing crackers as per the treatments T_1, T_2, T_3, T_4, T_5 and T_6 *i.e.,* 100:0, 95:5, 90:10, 85:15, 80:20 and 75:25, respectively. The preparation of pumpkin crackers involved the mixing of refined wheat flour with pumpkin flour in different proportions and other ingredients (water, baking powder, butter, sugar, salt) according to the formulation described by Kohajdova *et al.* (2013). Refined wheat flour was used for the preparation for control crackers. Preparation of crackers included these operations: mixing all the wet ingredients (sugar, water and butter) in separate bowl to a creamy texture. All the dry ingredients (baking powder, milk powder, salt, pumpkin powder and refined wheat flour) in another bowl and were mixed well. The dry ingredients were added into wet ingredients and mixed properly to form dough. The dough was allowed to rest for 10 minutes. Now with the help of floured rolling pin, dough was flattened into a large sheet of 2 mm thickness. Using a cracker cutter, the dough was cut into different shape and placed into a lightly greased and floured oven tray. The cracker containing tray was placed in a preheated oven at 210°C and dried for 8-10 minutes. The baked pumpkin crackers were removed from the oven and allowed to cool at room temperature. After cooling, the prepared crackers were packed in polypropylene bags stored for a period of three months under room temperature and were analysed for chemical characteristics at an interval of one month. The reducing and total sugar was estimated by the method of Somyogi, 1952 and Sadasivam and Manickam, (2008). The experiment was laid out in factorial CRD with six treatments and replicated thrice. The data obtained were statistically analysed as per the procedure of Gomez and Gomez (1984) using OPSTAT software. The detailed flow sheet is given in (figure 1).

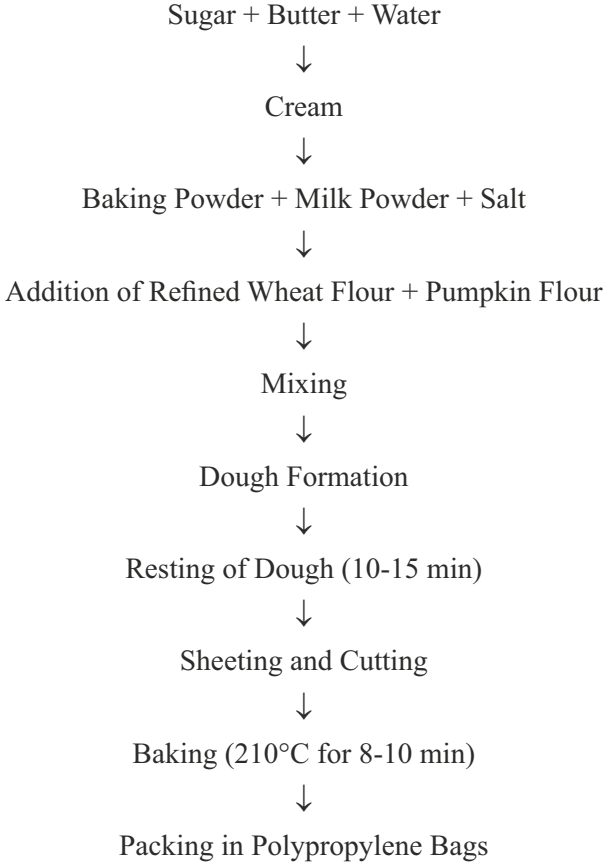

Fig . - 1 : Flow chart for Preparation of Pumpkin Crackers

RESULTS AND DISCUSSION

Physical characteristics of pumpkin crackers

Weight

The weight of crackers varied from 4.12 to 5.60 g (Table 1). The control crackers recorded the minimum weight (4.12 g) among all types of crackers. The crackers prepared with pumpkin flour up-to 25 per cent recorded maximum weight (5.60 g). Similar findings were also reported by Ebere *et al.* (2015) and Mihiranie *et al.* (2017).

Diametre

It is evident from the results that the mean values for diametre of pumpkin crackers decreased with increase in the pumpkin flour level into wheat flour. Mean diametre of pumpkin crackers prepared from different treatments revealed that the significantly higher value of 42.70 mm observed for the control sample whereas the lowest value of 41.94 mm found in treatment T_6 (75:25 :: refined wheat flour: pumpkin flour) (Table 1). The decrease in diametre of pumpkin crackers could be attributed to more powder replacement and might be due to improper leavening during baking in high fibre content of pumpkin crackers. Similar findings were observed by Hussain (2016) in biscuits blended with barley flour and buckwheat flour.

Width

The maximum and minimum width of pumpkin crackers were observed in T_1 (100:00 :: refined wheat flour: pumpkin flour) and T_6 (75:25 :: refined wheat flour: pumpkin flour) having values of 19.00 and 18.10, respectively. Similar results were also reported by Kuchtova*et al.* (2016) in pumpkin pomace crackers.

Thickness

Thickness of pumpkin crackers showed a gradual increase as the level of pumpkin flour increased with the values ranging from 3.50 mm in control to 4.10 mm in pumpkin crackers containing 25 per cent pumpkin flour and 75 per cent refined wheat flour. Increase in thickness of pumpkin crackers might be due to the decrease in diametre (Table 1). The results are correlated with Khalil *et al.* (2015) in wheat flour oat bran blended biscuits

Spread Ratio

The spread ratio of control cracker was 5.42 mm and it decreased to 4.41 mm with the addition of pumpkin flour (Table 1). This might be due to the gluten reduction effect of wheat flour. Similar results were reported by Hooda and Jood (2005) who also found reduction in spread ratio when soy flour and fenugreek flour were substituted in wheat flour.

Functional properties of refined wheat and pumpkin flour

It is evident from the Table 2 that the solubility index of pumpkin flour and refined wheat flour were 35.8 and 9.32 per cent, respectively. The swelling capacity of pumpkin flour and refined wheat flour were 93.3 and 53.71 per cent, respectively. Water absorption capacity of pumpkin and refined wheat flour were 470 and 149 per cent, respectively. Similar results have also been reported by Aziah and Komathi (2009), Adeleke and Odedeji (2010), Saeleaw and Schleining (2011), Islam *et al.* (2012) and Kuchtova*et al.* (2016).

Reducing sugar content

The data pertaining to reducing sugar content of pumpkin crackers in Table 3 depicted a significant increase in reducing sugars with the incorporation of pumpkin flour. At the beginning, the significantly higher reducing sugar content 5.40 per cent recorded in treatment T_6 (75:25 :: refined wheat flour: pumpkin flour) followed by 4.88 per cent in T_5 (80:20 :: refined wheat flour: pumpkin flour). Whereas, the lowest value of 1.86 per cent observed in treatment T_1 (100:00 :: refined wheat flour: pumpkin flour). Similarly after three months of storage, treatment T_6 (75:25 :: refined wheat flour: pumpkin flour) recorded significantly higher value of 4.44 per cent whereas, lowest reducing sugar

content of 1.04 per cent recorded in T_1 (100:00 :: refined wheat flour: pumpkin flour). On comparing statistically the mean values of treatments, minimum treatment mean total sugar content of 1.45 per cent observed in T_1 (100:00 :: refined wheat flour: pumpkin flour) whereas maximum treatment mean reducing sugar content of 4.96 per cent was recorded in T_6 (75:25 :: refined wheat flour: pumpkin flour), respectively.

The decrease in sugar content during storage might be due to the thermal degradation of sugars during baking and sugar polymerization during storage (Thivani*et al.,* 2016). Similar results were also reported by Hosamani*et al.* (2016) in carrot, jackfruit and aonlapowder based biscuits.

Total Sugar Content

The data pertaining to total sugar content of pumpkin crackers in Table 3 depicted a significant increase in total sugars with the incorporation of pumpkin flour. At the start, the significantly higher total sugar content 13.45 per cent recorded in treatment T_6 (75:25 :: refined wheat flour: pumpkin flour) followed by 13.09 per cent in T_5 (80:20 :: refined wheat flour: pumpkin flour) whereas, lowest value of 11.45 per cent observed in treatment T_1 (100:00 :: refined wheat flour: pumpkin flour). After one month of storage, treatment T_1 (100:00 :: refined wheat flour: pumpkin flour) and T_6 (75:25 :: refined wheat flour: pumpkin flour) recorded the lowest and highest total sugar content of 11.21 and 13.21 per cent, respectively. Similarly after three months of storage, treatment T_6 (75:25 :: refined wheat flour: pumpkin flour) recorded the significantly higher value of 12.67 per cent whereas, lowest total sugar content of 10.67 per cent observed in T_1 (100:00 :: refined wheat flour: pumpkin flour). While compared statistically the mean values of treatments, minimum treatment mean total sugar content of 11.07 per cent observed in T_1 (100:00 :: refined wheat flour: pumpkin flour) whereas maximum treatment mean total sugar content of 13.07 per cent recorded in T_6 (75:25 :: refined wheat flour: pumpkin flour).

The total sugar content of pumpkin crackers decreased significantly with the increase in the storage period. Highest mean total sugar content of 12.51 per cent recorded at initial month of storage while as lowest value of 11.73 per cent was observed after three months of storage. The decrease in sugar content during storage might be due to the thermal degradation of sugars during baking and sugar polymerization during storage). Similar results were reported by Hosamani*et al.* (2016) in carrot, jackfruit and aonlapowder based biscuits.

Table - 1 : Physical Characteristics of Pumpkin Crackers

Treatments	Weight (g)	Diameter (mm)	Width (mm)	Thickness (mm)	Spread Ratio (w/t)
T_1 (100:0:: Refined wheat flour: pumpkin flour)	4.12	42.70	19.00	3.50	5.42
T_2 (95:5:: Refined wheat flour: pumpkin flour)	4.40	42.30	18.70	3.65	5.12
T_3 (90:10:: Refined wheat flour: pumpkin flour)	4.94	42.20	18.52	3.80	4.87
T_4 (85:15:: Refined wheat flour: pumpkin flour)	5.20	42.15	18.43	3.87	4.76
T_5 (80:20:: Refined wheat flour: pumpkin flour)	5.35	42.00	18.30	3.95	4.63
T_6 (75:25:: Refined wheat flour: pumpkin flour)	5.60	41.94	18.10	4.10	4.41
$CD_{0.05}$	0.04	0.45	0.15	0.05	0.18

Table - 2 : Functional Properties of Refined Wheat Flour and Pumpkin Flour

Constituents	Refined Wheat Flour	Pumpkin Flour
Solubility index (%)	9.32	35.8
Swelling capacity (%)	53.71	93.3
Water absorption capacity (%)	149	470

Table - 3 : Effect of Treatment and Storage Period on Reducing and Total Sugar Content of Pumpkin Crackers

Treatments Refined wheat:Pumpkin Flour	Reducing sugar (%)					Total sugar (%)				
	Storage period (Months)					Storage period (Months)				
	0	1	2	3	Mean	0	1	2	3	Mean
T_1(100:0)	1.86	1.62	1.28	1.04	1.45	11.45	11.21	10.95	10.67	11.45
T_2 (95:5)	2.27	2.03	1.69	1.31	1.83	12.01	11.77	11.51	11.23	12.01
T_3 (90:10)	3.44	3.20	2.86	2.48	3.00	12.35	12.11	11.85	11.57	12.35
T_4 (85:15)	4.00	3.76	3.42	3.02	3.55	12.73	12.49	12.23	11.95	12.73
T_5 (80:20)	4.88	4.64	4.30	3.92	4.44	13.09	12.85	12.59	12.31	13.09
T_6(75:25)	5.40	5.16	4.82	4.44	4.96	13.45	13.21	12.95	12.67	13.45
Mean	3.64	3.40	3.06	2.70		12.51	12.27	12.01	11.73	12.51
CD (5%)										
Treatments	0.02					0.02				
Storage	0.02					0.02				
Treatment x Storage	0.05					0.05				

Cost of production of pumpkin crackers

The cost of production of pumpkin crackers (Table 4) of treatment T_4 (85:15 :: RWF:PF) was adjudged as the best is based upon cost of all ingredients used and some other factors. The wheat flour with pumpkin crackers is a new product, its cost of production is very low *i.e.* ₹ 13.72 per 100 g whereas, wheat flour crackers available in market costs ₹ 35 per 100 g.

CONCLUSION

It can be concluded that the best quality crackers can be prepared by using 85 per cent refined flour and 15 per cent pumpkin flour. The cost of production of blended pumpkin crackers is economical. The developed technology for the preparation of pumpkin crackers is simple, economically viable which can be explored at industrial scale for entrepreneur and stakeholders.

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Table - 4 : Cost of Production of Pumpkin Crackers (85:15::Refined Wheat Flour : Pumpkin Flour)

Ingredients	Rate@ ₹	85:15::Refinedwheatflour:Pumpkinflour	
		Quantity	Amount(₹)
(A)Variablecost			
(a)Costof input			
Refinedwheatflour	30/500 g	85 g	5.1
Pumpkinflour	20/500g	15 g	0.6
Butter	42/100 g	30 g	12.6
Sugar	50/1kg	50 g	2.5
Bakingpowder	25/100 g	0.5 g	0.12
Custard powder	30/130 g	2.5 g	0.58
Milk powder	30/100 g	2.5 g	0.75
Milk	25/ 500 ml	50 ml	2.5
Salt	20/kg	0.3 g	0.006
Packaging material	0.5/pouches	3	1.5
Totalcost			26.25
(b)Cost of labourandfuel	@ 15%		3.93
Totalvariablecost	a+b		30.18
(B)Fixedcost			
Machinery depreciation @10% on the total machinery cost of 1 lac for 300 working days a year	@ 10%	10,000	
Machinerydepreciationfor one day		33.33	
Depreciation for 3 pouches		2.0	
Total fixed cost and variable cost		32.18	
Capacity of no. of pouches per day		50	
(C)Profitof totalvariablecost andfixedcost	@ 15%	4.82	
(D)GST of totalvariablecost, fixed costand profit	@ 12%	4.18	
GrandTotal for 3 pouches		**41.18**	

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Journal of Natural Resource and Development 19 (1) 35-41, 2024 | NAAS RATING : 4.23 | ISSN-0974-5033

SPECTACULAR EFFECTS OF DRUMSTICK LEAF POWDER : POTENTIAL TO IMPROVE HEMOGLOBIN LEVEL AMONG FARM WOMEN

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Received : 08.10.2023 Accepted : 22.12.2023

ABSTRACT

The aim of the study was to find out the Mal-nutrition is an alarming problem in the developing world, with serious consequences for human health and socio-economic development during 2022-2023. It is estimated that over 43% women of childbearing age suffer from anemia. Prevention and control against anemia rely on iron supplementation and food fortification on large scale. Both these methods are not affordable and feasible for farming community. The green leafy vegetables are always considered as an excellent component of the habitual diet in India. They are also protective foods and highly beneficial for the maintenance of health and prevention from diseases. Drumstick has lots of minerals that are essential for growth and development among which, iron and calcium is considered as one of the important minerals for human growth. Drumstick can also be preserved by solar dryer for a longer duration without loss of nutrients. Preservation by dehydration improves the shelf life of Drumstick without change in nutritional value.

Drumstick powder can be used to supplement iron (substitute for iron tablets) as a treatment for anemia. By keeping in mind, KVK Pratapgarh under the guidance of ICAR-ATARI, Kanpur has developed Drumstick leaf powder after drying it in solar dryer under the proposed on farm trial. It has been distributed to 30 farm women to assess the efficacy of drum stick leaf powder as iron supplement (replacement of iron tablet) @10 gram /day to the farm women who were anemic (Hb- 8.00 g/dl) for 90 days continuously. After 90 days, Data revealed that Hb of those farm women were increased 1.25g/dl after post haematology report and drastic result was observed. After successful trial, training has given to self-help groups to impart the methodology of processing and drying of drumstick leaves which includes selection, plucking the fresh and tender leaves, washing thoroughly 2-3 times and dry in solar dryer. This technology has been handed over to SHGS to produce at KVK premises under the banner of SHGS with technical support of KVK with *fssai-12722008000081.*

Keywords : *Anemia, fssai, Hb, Drumstick leaf powder, nutritional value and solar dryer.*

INTRODUCTION

Hemodilution is a physiological process that occurs during pregnancy. A blood-thinning phenomenon that peaks around 32 weeks' gestation occurs when pregnant women suffer a reduction in blood plasma or an increase in blood cells that are out of balance with an increase in blood volume. Less hemoglobin will exist if the dietary requirements are not met. Pregnant women thus need a healthy diet (Tjokroprawiro A. 2015).

Pregnant women with less hemoglobin are <11 gr%, according to the WHO. Pregnant women in Indonesia are receiving iron supplements from the government, with a recommended intake of 90 tablets during pregnancy period. According to statistics from the Indonesian Health Profile Report, South Sulawesi administers Fe3 tablets on average less often than the national average of 64.5%, whereas the nationwide coverage of pregnant women getting Fe3 tablets is 85%. K4 coverage is 444 and Fe3 tablets are administered to pregnant women at 76.3% in the Tamalatea Puskesmas data (Kemenkes R., 2016).

Pregnant ladies need the provision of blood-booster tablets, which will raise the mother's blood hemoglobin levels. This hasn't been able to solve the issue of pregnant women's hemoglobin levels being sufficient, however. It is also vital to take into account the nutrients taken since iron tablets have not been successful and because of issues with program management, compliance, and administration schedule (Suriati, I. 2016).Taking drumstick leaf flour may help pregnant women satisfy their iron requirements and overcome nutritional deficits. Pregnant women need a lot of nutrients, which drumstick leaf flour provides (Kurnia *et. al*. 2018).

MATERIALS AND METHODS

The present study was carried out at Krishi Vigyan Kendra, Pratapgarh (U.P.) during the year 2022-2023 Uniform ages of farm women (35-40 year). Moringa powder can be used as a substitute for iron tablets, as a treatment for anaemia. By keeping in mind, KVK Pratapgarh under the guidance of ICAR-ATARI, Kanpur has developed Drumstick leaf powder after drying it in solar dryer under the proposed on farm trial. It has been distributed to 30 farm women to assess the efficacy of drum stick leaf powder as iron supplement

Drying of Drumstick leaf in solar dryer

(replacement of iron tablet) @10 gram /day to the farm women who were anaemic (Hb- 8.25 g/dl) for 90 days continuously.

The green leafy vegetables are always considered as an excellent component of the habitual diet in India. They are also protective foods and highly beneficial for the maintenance of health and prevention from diseases. Drumstick has lots of minerals that are essential for growth and development among which, iron and calcium is considered as one of the important minerals for human growth. Drumstick can also be preserved for a longer time without loss of nutrients. Drying can be done to store the leaves. Preservation by dehydration improves the shelf life of Drumstick without change in nutritional value.

Nutrients	Fresh Leaves	Dried Leaves	Leaf Powder
Iron (mg)	0.85	25.6	28.2

Source: Nutritional Characterization of Drumstick Leaves *J. Biotechnol.* 2011.

Interventions Taken of drumstick powder

After 90 days, Data revealed that Hb of those farm women were increased 1.25g/dl after post haematology reportand drastic result was observed. After successful trial, training has given to self help groups to know about procedure of drying get fresh

tender leaves, pluck the leaves and discard the stems and stalks and then wash them thoroughly 2-3 times with enough water and to dry in solar dryer and handed over this technology to SHGS to produce at KVK premises under the banner of SHGS with technical support of KVK with ***fssai-12722008000081***

Drumstick leaves powder has moisture content about 5.53 percent. The minerals such as iron and calcium were found to be 24.33 mg and 632.32 mg per 100 g respectively. The dehydrated drumstick leaves powder has got good acceptability and is having fairly good storage stability which can be promoted as a green leafy vegetable as a flavoring agent for preparation of souring Chutney, Sauces and Curries for regular consumption.

↓

Problem Identification

↓

On Farm Trials

↓

Product preparation and standardization

↓

FSSAI certification

↓

Commercial production

Impact of drumstick leaf powder

- Increased Hb level: It has improved hemoglobin level average from 8.25Hb Level (g/dL) to 9.25 Hb Level (g/dL) within 90 days.
- Due to increase Hb level, tiredness, vomiting and feeling uncomfortable at some time also improved.
- Replacement of iron tablet which cost 10rs one tab.@ 90 days which cost is 900 Rs. Total saving of 300 Rs. While using drumstick leaf powder@90 days
- Group has started the commercial production to cater the need of farm women and supplied drumstick leaf powder (pack of 90 days) to approx. 500 women.

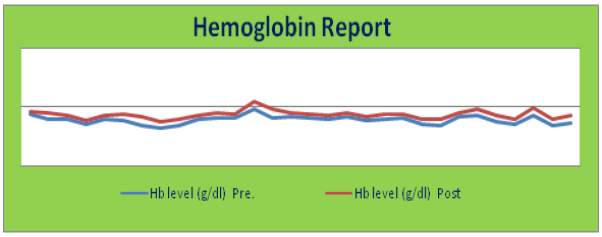

Fig. 1 : pre and post of hemoglobin report

Pregnant women 28 weeks or older made up the study's sample. They were split into two groups: the intervention group received capsules containing drumstick leaf flour. In this research, iron was administered to the control group via interviews and control sheets. The responder fills out all the information, including the identification. Check hemoglobin levels using standardized instruments marketed under the Diaspect Tm brand. Iron (Fe) capsules were given to the control group and Drumstick leaf flour capsules to the intervention group by the researchers. For sixty days, a dosage of two capsules each day was administered.

Blood test (n=30)

Finished Product

Nutrient values of leaves and pods of Drumstick (Moringa oleifera)

There are 205 grams of calories, 38.2 grams of carbohydrates, 27.1 grams of protein, 2.3 grams of fat, 19.2 grams of fiber, 2003 mg of calcium, 368 mg of magnesium, 204 mg of phosphorus, 0.6 mg of copper, 28.2 mg of iron, 870 mg of sulfur, and 1324 mg of potassium per 100 grams of drumstick leaf flour that contains 7.5% water. (Haryadi N.K., 2011)

Principle	Nutrient value-Leaves	Nutrient value-Pods
Vitamins		
Folates	40 µg (10%)	44 µg (11%)
Niacin	2.220 mg (14%)	0.680 mg (4%)
Pyridoxine	1.200 mg (92%)	0.120 mg (9%)
Riboflavin	0.660 mg (51%)	0.074 mg (6%)
Thiamin	0.257 mg (21.5%)	0.053 mg (4.5%)
Vitamin A	7564 IU (252%)	74 IU (2.5%)
Vitamin C	51.7 mg (86%)	141 mg (235%)
Electrolytes		
Sodium	9 mg (0.5%)	42 mg (3%)
Potassium	337 mg (7%)	461 mg (10%)
Minerals		
Calcium	185 mg (18.5%)	30 mg (3%)
Iron	4.00 mg (50%)	0.36 mg (4.5%)
Magnesium	147 mg (37%)	45 mg (11%)
Phosphorus	112 mg (20%)	50 mg (9%)
Selenium	0.9 µg (1.5%)	8.2 µg (15%)
Zinc	0.60 mg (5%)	0.45 mg (4%)
Energy	64 Kcal (3%)	37 Kcal (2%)
Carbohydrates	8.28% (6%)	8.53 g (6.5%)
Protein	9.40 g (17%)	2.10 g (4%)
Total Fat	1.40% (7%)	0.20 g (1%)
Cholesterol	0 mg (0%)	0 mg (0%)
Dietary Fiber	2.0 g (5%)	3.2 g (8%)

RESULTS AND DISCUSSION

According to the study's findings, the hemoglobin levels of 19 individuals with hemoglobin levels below 11 grams per deciliter rose by 100% after receiving Drumstick leaf flour for duration of 60 days. The quantity of the dosage administered the respondents' compliance, and how often they consume drumstick leaf flour all likely have an impact on this circumstance. Iron (Fe) is present in significant concentrations in drumstick leaf flour. Even the iron content of Drumstick leaf flour, which is formed from the leaves, is much higher—28.2 milligrams per 100 grams of leaf flour. Hemoglobin rose by 52.6% in the Fe group. It is probably brought on by the respondents' adherence to their consumption plans in addition to a number of other variables, such age. The bulk of responders, who were between the ages of 20 and 35, did not find a statistically significant difference between the Fe group and the drumstick flour group. Nonetheless, the majority group's income was poor and their educational attainment was limited to junior high school. An individual will have a more respectable career and salary the better educated they are. The mother's nutrition and food intake throughout the latter months of her pregnancy are mostly determined by her income.

According to the research, 73.3% of pregnant women (20–35 years old) with hemoglobin levels <11 g/dl were considered to be at risk-free age. In contrast, just 10.5% of those under 20 and 15.8% of people over 35 are at danger. According to statistical test findings, there is no significant correlation between maternal age and hemoglobin levels ($P > 0.05$).

The age range between 20 and 35 is considered safe for pregnancy and delivery. Pregnancy may lead to early food competition between the developing baby and the expanding mother as well as the increase of hormones associated with pregnancy (Setiawan, 2010). Women who were 20 years of age or older and pregnant were at risk of hemorrhaging, which may result in anemia.

The same findings were reported in the research (Wiraprasidi *et al*., 2017), which found that although only 15.8% of pregnant women between the ages of 20 and 35 were at risk, 80.3% of them had hemoglobin levels <11 g/dl. According to statistical test findings, $P>0.05$ was found [9]. On the other hand, it is inversely proportionate to the study Meliati *et al.* 2014, which found a significant

association between age and hemoglobin levels in pregnant women, with a value of P = 0.0332 (a <0.05).

In this research, primiparous pregnancy was revealed to have the mean parity. Muscle fibers in the uterus will transform into connective tissue throughout every pregnancy and delivery. It may decrease the uterus's capacity. When a woman is primiparous, her condition is poor as it is her first pregnancy, which makes it possible for her to experience symptoms like weakness, anorexia, and anxiety. The safest parity for maternal mortality is 2-3 (Setya, 2012).

In their research, (Ammalia *et al.,* 2017) shown that hemoglobin and parity had a significant link, with a value of P = 0.005 (a <0.05). The findings are consistent with the hypothesis that the frequency of anemia and the number of pregnancies are related (Amallia *et al.* 2017).

According to the notion proposed by frequent pregnancy and delivery have an impact on anemia; the more frequently a woman experiences these events, the more iron she loses and the more anemic she becomes. Anemia during pregnancy has an impact on parity. Because pregnancy depletes the body's iron stores, a woman's chance of having anemia increases with the frequency of her pregnancies and deliveries (Setya 2012).

In this research, the majority of the gestational age is 30 weeks. Pregnant women need iron in addition to growing gestational age. Dilution, also known as hemodilution, increases during pregnancy in accordance with the gestational age, which peaks between 32 and 34 weeks after conception.

The gestational age and iron tablet administration are closely correlated, according to, since more iron is given to respondents the older they are gestationally (Sukasmiati 2012). Gestational age and anemia status are significantly correlated, according to statistical tests with a P = 0.004 value.

The lack of significant differences between the two groups in the education and income factors indicates that there is a link between education level and hemoglobin levels, which rise in tandem with lower education levels [15]. Pregnant women's degree of education and knowledge are correlated. Maternal ignorance influences information intake, resulting in a lack of understanding regarding iron. Information acquisition becomes simpler the more educated a person is (Notoatmodjo, 2007). Pregnant women's altered hemoglobin levels raised the mean. The average findings indicate that hemoglobin levels in the drumstick leaf flour group were 10.22 gr/dl at the pretest and climbed to 11.68 gr/dl at the posttest, whereas in the Fe group, hemoglobin levels were 10.18 gr/dl at the pretest and 10.95 gr/dl at the posttest.

The intervention and control groups experienced a shift before to and after the administration of Drumstick leaf flour capsules. Hemoglobin levels may be raised higher with drumstick leaf flour than with Fe supplementation. It might be brought on by a number of things, including the 2,000 mg/day dose of Drumstick leaf flour, which has 28.2 mg of iron per 100 grams of components. Furthermore, as compared to Fe capsules, which only contain 60 mg of iron and 500 mg of folic acid, the nutritional content of drumstick leaf flour is not significantly lost, such as vitamin C, which may aid in the process of absorbing iron more rapidly (Notoatmodjo, 2007).

CONCLUSION

Both before and after the intervention, the pregnant women in the Drumstick group and the control group had higher hemoglobin levels. Hemoglobin levels are affected when pregnant women consume flour made from Drumstick leaves.

The mean difference in hemoglobin levels between the Iron and Drumstick groups varies. It has been distributed to 30 farm women to assess the efficacy of drum stick leaf powder as iron supplement (replacement of iron tablet) @10 gram /day to the farm women who were anemic (Hb- 8.00 g/dl) for 90 days continuously. After 90 days, Data revealed that Hb of those farm women were increased 1.25g/dl after post hematology report and drastic result was observed. After successful trial, training has given to self-help groups to impart the methodology of processing and drying of drumstick leaves which includes selection, plucking the fresh and tender leaves, washing thoroughly 2-3 times and dry in solar dryer. This technology has been handed over to SHGS to produce at KVK premises under the banner

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Journal of Natural Resource and Development 19 (1) 42-46 2024 | NAAS RATING : 4.23 | ISSN-0974-5033

EFFECT OF FEEDING CUMIN SEED POWDER ON PERFORMANCE OF VANARAJA POULTRY BIRDS

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Received : 13.09.2023

ABSTRACT

The present experiment entitled ""Effect of Feeding Cumin Seed Powder on Performance of Vanaraja Poultry Birds" was reared on Santosh poultry form sitapur chitrakoot carried out in small animal laboratory of Department of (N.R.M.) Faculty of Agriculture, Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Chitrakoot, Satna (M.P.). A total of 72 DOC of same hatch were procured and randomly divided into four groups with six sub groups comprising of three chicks in each to serve as replicates. The birds were reared in battery type cages under standard manage mental practices from day-old to six weeks of age. Freshly collected, Cumin seed powder was supplemented as per treatment to the standard broiler ration. The broiler starter ration contained (CP: 22 and, ME:2900) and broiler finisher ration contained (CP:19andME: 3000)were fed *ad lib* to the birds. Four group of DOC were subjected to fan treatments on T_1, T_2,T_3 and$T_4$for following dietary regions: T_1 - Standard ration, T_2--Standard ration + 1.0% Cumin seed powder, T_3 -Standard ration+1.5% Cumin seed powder, T_4 - Standard ration +2.0% Cumin seed powder. It was conclusion that there was a significant effect of different treatment of cumin seed powder supplementation if feed on body weight , gain in weight, FCR, level ($P<0.05$). significantly better FCR in broilers was observed in ration supplemented with standard ration +2% cumin seed powder. From economic point of view feed containing standard ration +2% cumin seed powder was found better performance due to significantly lowest feed consumption feed conversion ratio.

Accepted : 15.10.2023

Keywords : *Broiler chicks, growth performance, cumin seed powder.*

INTRODUCTION

The poultry production systems led to marked increase in the production of poultry meat and eggs throughout the world *(Armstrong, 1986*). It has triggered the discovery and widespread use of a number of "feed additives". The term feed additives is applied in a broad sense, to all products other than those commonly called feedstuffs, which could be added to the ration with the purpose of obtaining some special effects. The main objective of adding feed additives is to boost animal performance by increasing their growth rate, better-feed conversion efficiency, greater livability and lowered mortality in poultry birds. These feed additives are termed as "growth promoters" and often called as non-nutrient feed additives (*Singh and Panda, 1992)*.

Growth of poultry sector can contribute to enhanced nutrition and poverty reduction in India, because a large share of the ruler poor are depend on poultry for food and income, because of widespread protein - energy and micronutrient malnutrition, and because the demand for animal source food

including milk ,meat and egg- is massively increasing in South Asia, and government of India recognized that growth in the poultry sector has so far only marginally contributed to poverty reduction and improve nutrition(Pics and Otte, 2009).

Growth and production traits of a bird indicate its genetic constitution and adaptation with respect to the specific environment Loss in output might be due to genotype, ambient factors, management and climate (Cahaner and Leenstra, 1992). Similarly, earlier studies have shown that different agro-climatic zones in West Bengal have an effect on productive performance of RIR birds (Das *et al.,* 2014).

Genetic evaluation of pure line chicken populations is very important to assess the population status with respect to different economic traits. The inheritance pattern of different economic traits and their association with other traits helps the breeder to plan the breeding programs for improving the productivity (Chandan *et al.* 2019). Pure lines developed through genetic selection are being used to develop crossbreds for backyard poultry farming involving native and exotic strains for backyard poultry farming (Padilla S.2010).

Vanaraja chickens are accepted by the farmers due to its colour pattern, growth rate, taste of meat and production of more eggs compared to indigenous chicken reared traditionally. The farmers' preference of Vanaraja for meat purpose particularly is due to fast attainment of market age under traditional backyard system of rearing with limited non-commercial feed. The lesser number of local chicks in the present study compared to Vanaraja chicks was due to lack of commercial availability. The mortality rate during and after brooding stage was 3% and 10% among Vanaraja and local chicken respectively. The Vanaraja bird is hardy and has better immune competence due to which it is successfully adaptable under backyard farming system (Niranjan *et al.,* 2008). Vanaraja female line (PD-2) is the female parent line of Vanaraja; a proven dual purpose backyard chicken variety Vanaraja development and introduction in to backyard has transformed the face of traditional backyard poultry in India (Rajkumar *et al,* 2010). Genetic improvement in egg production without compromising the egg weight in female lines is very important to improve the productivity in terminal crosses (Chandan *et al,* 2019).

Cumin is the second most popular seed species after black pepper. It is an annual plant and is also one of the oldest and most cultivated aromatic and herbaceous natural products with numerous medicinal, nutraceutical, and pharmaceutical properties. Cumin also has wide usage in the beverage, food, liquor, medicine, perfume, and toiletry industries. It is native to and cultivated extensively in several places, mainly in arid and semi-arid climates, such as China, Egypt, Saudi Arabia, and the Mediterranean, as well as India and Iran. However, the largest consumer of cumin seed in the world is India while China is the largest exporter and producer. Cumin has remarkable antioxidant properties and is traditionally used as an astringent, carminative, coagulant and stimulant, as well as remedy against diarrhea, dyspepsia, epilepsy, toothache, whooping cough, flatulence, indigestion, and jaundice (Thippeswamy N.*et.al, 2005).*

The seeds of cumin are characterized by abortifacient, antispasmodic, diuretic, emmenagogic, carminative, and stomachic properties. Oleoresin from the seeds is commonly applied in crackers, sauces, meat, and sausages. The distinct and strong aroma of the seeds are responsible for its use as spices as well as other medicinal uses. The aroma is mainly due to cuminol which makes up 2.5 – 4.0% of the seed. The essential oils of cumin seeds primarily contain hydrocarbons

and aldehydes (Kanani P. *et.al,* 2019).

MATERIALS AND METHODS

The present experiment entitled "Effect of Feeding Cumin Seed Powder on Performance of Vanaraja Poultry Birds" was reyard on santosh poultry form sitapur chitrakoot carried out in small animal laboratory of Department of N.R.M. Faculty of Agriculture, Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Chitrakoot, Satna (M.P.).

Chicks :-

A total of 72 DOC of same hatch were procured and randomly divided into four groups with six sub groups comprising of three chicks in each to serve as replicates, with the following dietary regimens:

The birds were reared in battery type cages under standard manage mental practices from day-old to six weeks of age. Freshly collected, Cumin seed powder was supplemented as per treatment to the standard broiler ration. The broiler starter ration contained (CP: 22 and, ME:2900) and broiler finisher ration contained (CP:19andME: 3000)were fed *ad lib* to the birds.

3.1 Test rations Four group of DOC were subjected to fan treatments on T_1, T_2,T_3 and$T_4$for following dietary regions:Treatments are as follows:

T_1 - Standard ration.

T_2--Standard ration + 1.0% Cumin seed powder.

T_3 -Standard ration+1.5% Cumin seed powder.

T_4 - Standard ration +2.0% Cumin seed powder.

RESULTS AND DISCUSSION

The results pertaining to the body weight of DOC contained in Table 4.1indicated that mean highest body weight of broilers was observed in T_4 (43.83g)followed by T_3, T_2 and T_1 (43.00) but it was not significantly different from other treatments. This indicated that the random distribution of chicks among the different treatments was proper and unbiased.

1.0- Weekly average body weight of broilers :-

The data regarding average weekly body weight of broilers are presented in Table 1.0 and figure1.0 It may be noted that irrespective of treatments mean body weight per broiler in first week, second, third; fourth, fifth and sixth week was 819.61, 843.14, 880.20, 949.92g respectively. Similarly the mean body weight of broilers in T_1, T_2, T_3, and T_4 irrespective of weeks was142.96, 332.67, 638.71, 954.33, 1370.04, 1800.59g respectively and the differences of broilers treatments were found significant. Results showed that dietary inclusion. of cumin seed powder in ration caused significant increase in growth resulting in higher body weight.

Table 1.0 : Weekly average body weight (g) per broiler in four different Treatments.

Average body weight of broiler in different treatments(g)					
Weeks	**T_1**	**T_2**	**T_3**	**T_4**	**Mean**
1	138.33	138.33	146.33	148.83	**142.96**
2	310.17	321.50	342.17	356.83	**332.67**
3	587.00	608.50	643.33	716.00	**638.71**
4	874.83	910.83	966.17	1065.50	**954.33**
5	1291.33	1327.00	1376.50	1485.33	**1370.04**
6	1716.00	1752.67	1806.67	1927.00	**1800.59**
Mean	**819.61**	**843.14**	**880.20**	**949.92**	

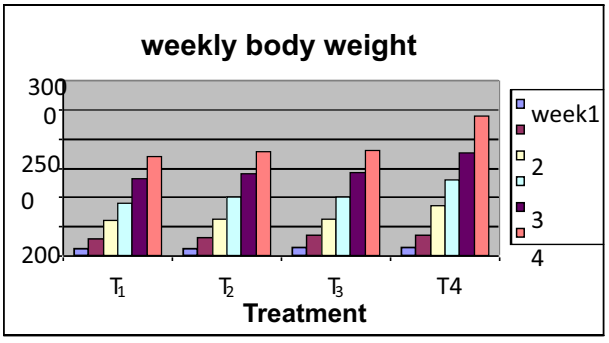


Fig. 1.0-: Average weekly body weight (g) of broilers of different treatments

2.0- Average gain in weight of broilers (g)

In general highest mean weight gain per broiler was observed in T_4followed by T_3, T_2 and T_1. Based upon this study, it could be concluded that

using the medicinal seed powder of black cumin (Nigella sativa L.) as a natural feed additive at a rate of 2% revealed positive effects on the performance and survivability of broilers grown at normal conditions in an open sided environment.

Table 2.0 : Weekly average weight gain (g) in broilers of four different treatments.

Average weight gain per broiler in weekly					
Weeks	**T_1**	**T_2**	**T_3**	**T_4**	**Mean**
1	95.33	94.83	102.67	105.00	**99.46**
2	171.83	183.17	195.83	208.00	**189.71**
3	276.83	287.00	301.17	359.17	**306.04**
4	287.83	302.33	322.83	349.50	**315.62**
5	416.50	416.17	410.33	419.83	**415.71**
6	424.67	425.67	430.17	441.67	**430.55**
Mean	**278.83**	**284.86**	**293.83**	**313.86**	

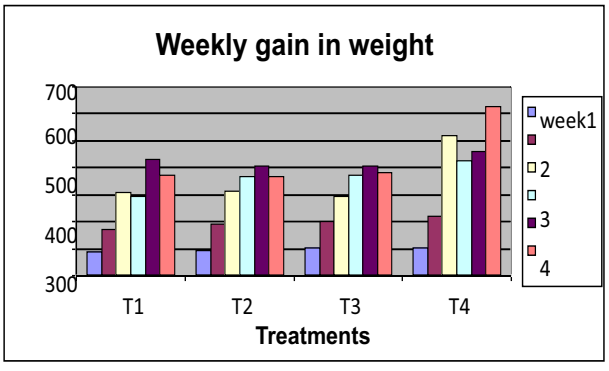


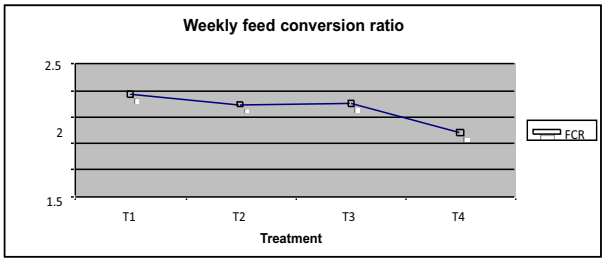
Fig. 2.0 : Weekly gain in weight (g) of broilers in four different treatments.

3.0-: Average weekly feed intake of broilers(g)

The results on feed intake contained table 3.0, irrespective of treatment average feed intake of broilers ranges from 142.10 to 763.28 g. The lowest feed intake was recorded in the broilers of T_4(471.21g)followed by treatments T_1 T_2& T_3 and differences in this values of feed at par were found significant. Indicating thereby significant effect of treatment on feed intake &lowest feed intake with better utilization of feed was observed on broilers of treatment T_4 compare to others. However, the feed intake of broilers in T_2 T_3 was found at par with control.

Table 3.0 Weekly average feed intake per broiler(g)in four treatments.

Average feed intake of broiler in different treatments(g)					
Weeks	**T_1**	**T_2**	**T_3**	**T_4**	**Mean**
1	165.70	154.60	158.10	142.10	**155.13**
2	316.21	315.78	314.94	306.62	**313.39**
3	534.59	526.00	523.78	499.00	**520.84**
4	558.33	557.31	551.89	546.31	**553.46**
5	756.23	733.10	738.02	686.68	**728.51**
6	763.38	696.15	669.52	646.56	**693.90**
Mean	**515.74**	**497.16**	**492.71**	**471.21**	



4.0-: Average weekly feed conversion ratio in broilers (g).

It may be noted that weekly FCR in broilers due to treatments was found non-significant and as with gain in weight of broiler the FCR results were also as expected. Broilers with Cumin Seed Powder supplements showed better FCR which was significant. However T_2 and T_3 were at par with FCR of broilers. The broilers in T_1 control registered relatively poor FCR than broiler inT_4,T_3, andT_2.

Table 4.0: Average weekly feed conversion ratio of broiler in different treatments

Average FCR per broiler in weekly(g)					
Weeks	T_1	T_2	T_3	T_4	Mean
1	1.743	1.644	1.551	1.37	1.58
2	1.843	1.728	1.61	1.474	1.66
3	1.93	1.842	1.743	1.395	1.73
4	1.981	1.902	1.748	1.585	1.80
5	1.876	1.764	1.823	1.718	1.80
6	1.792	1.669	1.543	1.487	1.62
Mean	1.86	1.76	1.67	1.50	

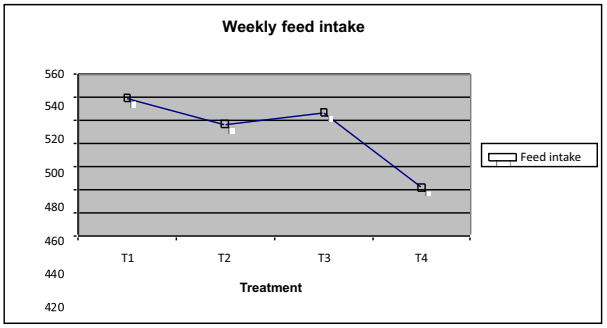


Fig.4.0 : Treatment–wise feed conversion ratio in broilers

CONCLUSION

It was conclusion that there was a significant effect of different treatment of cumin seed powder supplementation if feed on body weight , gain in weight, FCR, level ($P<0.05$). significantly better FCR in broilers was observed in ration supplemented with standard ration +2% cumin seed powder. From economic point of view feed containing standard ration +2% cumin seed powder was found better performance due to significantly lowest feed consumption feed conversion ratio.

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