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Effect of Integrated Nutrient Management on Yield Attributes and Yield of Lentil (*Lens culinaris* L.)

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ABSTRACT

This experiment was carried out in Randomized block design with Three replication and 10 treatments combination at Crop Research Centre-II, ITM University, Gwalior (M.P) During the *Rabi* season of 2022-23 entitled "Effect of Integrated Nutrient Management on growth, yield attribute and yield of lentil" (*Lens culinaris*. L)". The treatments consist of T_1 – Control, T_2 – 100% RDF (20:40:0 NPK), T_3 – 75% RDF + Vermicompost @2.5t/ha, T_4 – 75% RDF + Rhizobium, T_5 – 75% RDF + PSB, T_6 – 75% RDF + Rhizobium + PSB, T_7 – 50% RDF + Vermicompost @2.5t/ha + Rhizobium + PSB, T_8 – 75% RDF + Vermicompost @ 1.5t/ha + Rhizobium + PSB, T_9 -100% RDF + Vermicompost @ 1t/ha + Rhizobium + PSB. T_{10} – 125% RDF +vermicompost @ 0.5t/ha + Rhizobium + PSB. and each treatment were replicated thrice. and seeds were treated with Rhizobium and PSB. The INM practices Significantly affected the yield and yield attributes parameters like no. of pods /plant, pod length (cm), no of grains/pods, 1000 seed weight, grain yield (kg/ha), stalk yield (kg/ha), biological yield(kg/ha) and harvest index (%) was recorded under the treatment (T_{10}-125% RDF + vermicompost @ 0.5t/ha + Rhizobium + PSB) but it was at par with (T_9 -100%RDF +vermicompost @1t/ha + Rhizobium + PSB), (T_8 - 75%RDF + vermicompost @1.5t/ha + Rhizobium +PSB) and at par with rest of the treatments. and minimum yield parameters was recorded under control.

Key words: *Integrated Nutrients management, Growth, Yield, Quality of Lentil*

Introduction

Lentil (*Lens culinaris*. L) also known as Masur is a leguminous crop. It is recommended as one of the most nutritious pulse crops. ranking next to chickpeas amongst rabi pulses. It is one of the oldest pulse crops. It is also used as a cover crop to check the soil corrosion in problem areas. The plants are ploughed back into the soil as green manure also. It derives the name Lens from the lens-shaped seeds. In the Indian subcontinent, it is commonly consumed as dal, which is deep orange-red or orange-yellow in color. lentil or masur is one of the oldest crops that originated in the Near East and Mediterranean regions. It was known to the ancients in Egypt and Greece. It had spread to Europe, India, and China and now it is introduced and cultivated in most sub-tropical and warm temperate regions. As per the fourth advanced estimate from DES, Govt. of India, 2022- Uttar Pradesh is the leading lentil-producing state in India (0.47 million tonnes from 0.49 ha. acreage, 36.43 % of national production), followed by Madhya Pradesh (0.44 million tonnes from 0.49 million ha. acreage, 34.55% of national production), West Bengal (10.53%), Bihar (8.84%) and Jharkhand (4.50%) depending on their contribution in the national production of lentil.

Lentils are rich in carbohydrates, protein, fat, fiber, folate, thiamine, vitamins, minerals, potassium, copper, zinc, iron, and other essential nutrients and are used widely in the processing sector (unhusked seeds, split cotyledon dahl, savories, etc.). Among all the winter-season legumes, lentil has the highest concentration of essential amino acids (lysine, arginine, leucine, and other S-containing amino acids). The low yield of lentils is primarily due to their cultivation on poor and marginal soils with declining soil fertility and unpredictable environmental conditions, which have arisen as a result of intensive land use without proper1 replenishment of plant nutrients, particularly where high-yielding varieties of cereals are cultivated using unbalanced doses of mineral fertilizers with little or no organic recycling. The exhaustion of soil organic matter and degradation of soil physico-chemical characteristics due to insufficient and imbalanced fertilizer delivery without the application of organic manures are the main causes of declining soil fertility in these areas. As a result, it's critical to find the problem as soon as possible, because the lentil is a fantastically nutritious pulse crop, and its effective cultivation is only possible with the adoption of appropriate nutrition management strategies to alleviate farmers' arduous conditions. Despite significant development in the manufacturing and application of fertilizers in agriculture, their management in lentil production is neglected, possibly due to the lentil's lower nutrient requirements compared to cereals.

Methods and Materials

The experiment was conducted near the polyhouse research farm, Crop Research Centre-II, School of Agriculture ITM University, Gwalior. Madhya Pradesh is a state in India. During the *Rabi* season of 2022-2023, The research site is in the subtropics, at a height of 196 meters above sea level, with coordinates of 26° 21' N latitude and 78° 17' E longitude, representing the Indo-Gangetic plains region. The summers and winters in Gwalior are both extremely hot. A semiarid, subtropical climate characterizes Gwalior, with chilly temperatures ranging from mild to bitterly bitter in the winter, hot, dry days and desiccating hot winds in the summer, and warm, humid conditions during the monsoon season. With uneven changes in its distribution, the yearly rainfall runs from 600 to 700 mm. The southwest monsoon contributes between 80 and 90% of the region's total rainfall between July and September, and the region's typical climate ranges from a maximum temperature of 48°C in the summer with hot, desiccating winds to a minimum temperature of 0°C lower in the winter with frost. In order to conduct a chemical study of the soil in the experiment area prior to planning the layout, 5 samples were randomly selected from the soil profile between 0 and 15 cm deep. The soil type at the experimental location was sandy loam, with accessible soil nutrients (N, P, and K) total of 178.03, 24.45, and 382.15 kg/ha, as well as soil organic carbon at 0.41% and a soil PH of 7.4 at the time. The experiment was set up using Randomized Block Design, with 10 treatments combination that included with one control and various. The treatments consists of T_1 – Control, T_2 – 100% RDF (20:40:0 NPK) T_3 – 75% RDF + Vermicompost @ 2.5t/ha, T_4 – 75% RDF + Rhizobium, T_5 – 75% RDF + PSB, T_6 – 75% RDF + Rhizobium + PSB, T_7 – 50% RDF + Vermicompost @2.5t/ha + Rhizobium + PSB, T_8 – 75% RDF + Vermicompost @ 1.5t/ha + Rhizobium + PSB, T_9 - 100% RDF + Vermicompost @ 1t/ha + Rhizobium + PSB. T_{10} – 125% RDF +vermicompost @ 0.5t/ha + Rhizobium + PSB in the experimental plots and also complete RDF of **P** and **K** with three replications with a gross plot size of 15.0 m^2 (5m × 3.0m) having the total number of plots 30, and 20:40:0 kg/ha NPK fertilizer, which is the recommended dosage. At random times during the experimentation's yield and yield attributes at the harvest stage for each treatment, parameters were measured and recorded.

Results and Discussion

Yield parameters like No of pods per plant and pod length, no of grains per pod, 1000 seed weight (g) and maximum no of pods plant^{-1} was recorded (43.00) and maximum pod length was recorded (1.96 cm), maximum no of grains (2.67) and 1000 seed weight 25.82g) was recorded the maximum seed yield (1075 kg ha^{-1}) and Seed inoculation of Rhizobium + PSB seed recorded significantly higher seed yield as compared to uninoculated control except for micronutrient-treated plots. Dual application of biofertilizers gave more yield than a single application of biofertilizers. Improvement of yield due to the combined application of inorganic fertilizer and biofertilizer might be attributed to the controlled release of nutrients in soil through the mineralization of biofertilizer which might have facilitated better crop growth in the case of T10 (125% RDF + Vermicompost @0.5t/ha + Rhizobium +PSB) i.e., integrated use of fertilizer was done by combined ap-

Table 1. Effect of Integrated nutrient management on yield attributes and yield of lentil

Tri.no	Treatments	No of pods plant-1	Pod length (cm)	No of grains pod	1000 seed weight (g)	Grain yield (kg/ha)	Stalk yield (kg/ha)	Biological yield (kg/ha)	HI (%)
1	Control	20.00	1.69	1.08	22.17	503	876	1380	36.22
2	100% RDF (20:40:0 NPK)	28.67	1.74	1.58	22.33	726	1273	1999	36.20
3	75% RDF + Vermicompost @2.5t/ha	32.67	1.82	1.92	22.50	870	1492	2363	36.91
4	75% RDF + Rhizobium	29.67	1.76	1.58	22.42	737	1284	2021	36.44
5	75% RDF +PSB	30.00	1.77	1.67	22.42	745	1305	2050	36.67
6	75% RDF + Rhizobium + PSB	34.00	1.84	2.00	22.67	897	1527	2425	37.13
7	50% RDF + Vermicompost @2.5t/ha + Rhizobium +PSB	36.00	1.84	2.17	23.33	907	1536	2443	37.16
8	75% RDF + Vermicompost@1.5t/ha + Rhizobium +PSB	39.00	1.92	2.33	24.33	1033	1746	2779	37.27
9	100% RDF + Vermicompost@1/ha + Rhizobium +PSB	41.00	1.93	2.42	25.32	1058	1785	2844	37.31
10	125% RDF + Vermicompost@0.5/ha + Rhizobium +PSB	43.00	1.96	2.67	25.82	1075	1792	2868	37.51
	S.E(m)	1.58	0.02	0.12	1.32	44.27	75.14	95.66	1.67
	CD at 5%	4.71	0.07	0.37	3.92	131.53	223.25	284.22	4.96

plication of micro and macronutrients with FYM. So it was observed that micronutrients play a greater role in increasing the yield of crops than macronutrients. and stalk yield, as well as biological yield (2868 kg ha-^{1}), harvest index (37.51 %) was observed in T10 and the lowest was observed in control. was significantly affected by different treatments under consideration. In the case of stalk yield, (1792 kg ha-^{1}) was recorded in T10 followed by T9 and T8. The stalk yield of T10 and the Lowest stalk yield were found in control which was treated with the recommended dose of fertilizer (RDF). In this case, also combined the application of micronutrients along with macronutrients and gave higher yield as compared to all other treatments. The highest harvest index (35.51%) was found in T10 followed by T9 and T8 and lowest value was observed in control.

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