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Effect of nitrogen and phosphorus on growth and yield of Lentil (*Lens culnaris*)

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ABSTRACT

To find the effect of Nitrogen and phosphors on growth and yield of Lentil investigation was conducted at Sher-e-Kashmir University of Agricultural Science and technology of Kashmir, Shalimar at Pulse Research Sub Station (Habak) Srinagar during rabi 2010-11 the experiment consist of two factors viz four Nitrogen levels (N_0 ,N_{15}, N_{30} and N_{45}) and four phosphorus levels (P_0,P_{25},P_{50} and P_{75}) was laid out in a randomized block design replicated thrice. The study relieved that point height and dry matters accumulation showed significant and consistent increased at all growth stages up to 45 kg Nha ¯1 where as LAI and numbers of branches per plant increased significantly with Nitrogen application up to 30 kg Nha-1.The Phosphorous application significantly increased growth characters viz , plant height number of nodules LAI and No of branch plants and dry matters accumulation up to 50 kg P_20_5,ha^{-1} . The interaction affect of seed yield between N&P was significant where highest with treatment combination of 30 kg N+50kg P_20_5 ha-1 and 45 kg N+50kg P_2o_5 ha^{-1} respectively. Proved beneficial for highest seed yield of Lentil under temprate condition of kashmir.

Introduction

Lentil (Lens Culinaris) Modik a name given by the German botanist medikus in 1778 (cubero, 1981). The primary product of the cultivated lentil is the seed, which is a valuable human food product containing a high amount of protein (22.0-34.5%), carbohydrates (65%) and other minerals and vitamins (yadav etal 2007)since ,2008. In many sentries lentils are used as a meat substitute (Duke, 1981). The seeds are mostly eaten as dal in soups and the flour can be mixed with cereal flour and used in cakes, breads and some baby food (Muehlbauer etal 1995). In some parts of India, the whole seeds are eaten salted and fried young pods can also be used as green vegetables and the seeds can be a source of starch for textile and printing industries (Duke, 1981).

Additionally, Lentil residues can be used as a live stock feed as they have high contents of protein and crude fiber (Kay 1979). In the Indian sub content, lentils have been grown as a green manure in one year rotation with cereal, especially rice (Saxena and Hawtin 1981). Furthermore, lentils as all legumes, have the capability offixing atmospheric nitrogen through the symbiotic relationship with rhizobia bacteria (Islam,1981). The process nitrogen fixation in legumes is essential for both maintaining soil fertility and natural and agro-ecosystems productivity (Azam &Faroq,2003).

Lentil is predominantly grown in Asia which accounts for 80 percent of global area and 75% of world production. India ranks fist in area as well as production, in Lentil followed by Turkey. It occupies second place among the winter pulses after chickpea in the country covering an area of 1.48m ha with a production of 1.03m tones (Anonymous, 2011).

The major lentil producing states are utter Pradesh, Madhya Pradesh, Bihar, West Bengal, Rajesthan & Assam. In Jammu & Kashmir lentil is a relatively minor pulse crop as it is grown mainly on subtropical foothill soil with low fertility & water holding capacity. Locally known as Masoor.

Lentil is an important cool season food legume grown under marginal Lands by resilience poor farmers. It can tolerate frost & severe winter, hence well suited to the climatic conditions of Kashmir valley. It has good scope to be grown as an intercrop in young orchards. The area under pulses in Jammu & Kashmir 138-89 thousand quintals (Anonymous, 2010). Out of several nutrients provided to plants, nitrogen is a major and essential nutrient for better plant growth and yield. It is considered as most important nutrient for the crop to activate the metabolic activity and transformation of energy chlorophyll and protein synthesis and can constitute 40-50 of protoplasm of plant cell on dry weight basis and can be a limiting factor under such condition (De, 1993).

Most of the pulse growing soils are deficient in available P status. Many field experiments conducted in different agro climatic regions of the country have unambiguously crop is an economically viable proposition. Application of P to the pulse crop not only increased their productivity but also gives considerable pasa residue for succeeding crop. Phosphorous also improves the crop quality and enhances the crop resistance to diseases (Mann, 1968). Phosphate application to pulses not only benefit the particular crop in increasing its yield but also favorably affects the soil nitrogen content for the succeeding non legume crop which require lower doses of nitrogen application.

Material & Method: The study was carried out during rabi 2010-11 at Habak Srinagar area at (34.1 to 34.7)North Latitude and 74.89 meters above mean sea level. The mean maximum temperature was is 93 c and mean minimum temperature was 2. 08c while maximum relative humidity was 86.28% and minimum relative humidity recorded was 58.16%, whereas, total

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annual precipitation amounted to 428.10 mm during the cropping period.

The soil was salty clay loam in texture, neutral in reaction. The experiment was laid out in Randomized Block design with four levels of phosphorus and four levels of nitrogen with three replications.

The Lentil variety Shalimar Masoor- I were sown at the rate of 20kg/ha. Each plot accommodated 10 rows length wise and 30 plants bread wise. All agronomic practices were kept uniform and normal for all treatment. Data on plant height (cm) number of branches per plant, number of nodules per plant, fresh weight of nodules (g plant) dry matter accumulation (g plant-1/Q ha -1), leaf area index, number of pods per plant, number of seeds per pod, 1000- seed weight (g) seed yield, straw yield and harvest index were recorded during the course study by following standard procedure.

The data obtained in respect of various observations were statistically analyzed by the method described by Cochran and coy (1963). The significance of "F" and "T" was tested at 5% level of significance. The critical difference was determined when "F" test was significant.

Result & Discussion:- In the present study it is found that plant height increases with 0 to 5 Kg N ha-1where highest plant height record at 45kg N ha -1. In case of phosphorus there is great increase of plant height of m 0 to 75 Kg P ha -1 where height plant recorded at 75 Kg P ha -1.

The seed yield recorded height when we go for the interaction of nitrogen and phosphorus significantly highest seed yield of 9.70 Q ha -1 was recorded with the treatment of N4s P75 which was at par with N45 P 50- N30 P 75 and N 30 P50 (Table-I). The great increase in seed yield with the interaction of nitrogen and phosphorus could be attributed to increase in the growth character and yield attributes under the said treatment. Earlier Sharma (1999) Mandal and Majumder (2001), Nakh zeri Moghadam and Genetal (2005) Togayetal. (2005)and Rabbet at (2011) reported significant increase in seed yield with increase in N dose. Phosphorus fertilization at the rate of 25 50 and 75 Kg P205 ha -1 produced seed yield of 7.70, 8.35 and 8.71 Q ha-1 respectively. These doses of phosphorus registered an increase of 11.68, 18.56 and 21.92 percent over the control (0 P2 5 ha-1). These results are in conformity with the findings of Khare etal (1988)Tomar (2002), and Togay etal (2008).

Nodule number and nodule fresh weight by 44-95 and 51.49 percent pre flowering and ped filling stages respectively, over control (0 kg Nha -1). Earlier Mandle and Majumder (2001) also reported increase in the nodule number with increase in the Nitrogen closes. Application of higher quantity of Nitrogen might have favored rapid growth and enlargement of tissues. Resulting in higher leaf area index. These results are in close conformity with the result of Mohammad janlooet (2009). Number of branches. Being ancillary character is of utmost significant from the stand point of their contribution towards seed yield. Similarly application of phosphorus increases the availability of P to plants leading to higher contents in grain and straw.(Sarad and Baitha,1982).

Dry matter accumulation showed in significant and consistent improvement with Nitrogen application up to 45 kg Nha -1. Similar Findings were repeated by Kumar etal (1993) and hoque and Haq (1944).

The increase in Lentil seed yield with increasing fertility levels was mainly due to significant improvement in different yield contributing characters at higher Nitrogen levels. The results are in conformity with those of Sharme (1999). Moghadam Ramrodi (2003), Ganetal (2005).

More availability of nutrients with increasing the level of P2O5 ha-1 might have increased the number of seeds per pod. Seed yield and straw yield the results are in line with those of Subramanaian and Radhak (1981) and were also reported by Singh and Singh (1991), Krishnareddy and Ahlawat (1996) Singh and Kumar (1996) Zhaubey etal (1999) and Shah etal (2000). The protein content in the seed improved significantly by the application of Nitrogen and Phosphorus. The results are inconformity with those of Bekele and etal (2001), Singh etal (1983), Sharma etal (1987) Nirietal (2010).

Conclusion:-

The Study showed that significantly highest seed yield was released with application of 30 kg nitrogen along with 50 kg P2 O5 ha-1. Tha said treatment combination also recorded significantly highest growth and yield contributing characters and also good from the economic point of view released highest benefit cost Ratio to arrive at final conclusion the investigation need to be conducted at multinational sites of the valley.

Literature Cited.

Table-I

Treatment	No. of pods per Plant	No. of seeds per Pod	1000 seed weight (g)	Seed yield	Straw Yield qha-1	Harvest index
Nitrogen level (Kg ha-1						
0 (N0)	33.18	1.30	22.60	6.78	11.96	36.18
15 (N15)	35.97	1.41	23.48	7.65	12.86	37.29
30 (N30)	37.10	1.46	23.69	8.28	13.85	38.28
45 (N45)	37.18	1.48	23.73	8.85	13.85	38.98
Se (m)+	0.56	0.06	0.34	0.25	0.41	0.15
CD(P=0.5)	1.16	0.14	0.70	0.52	0.52	0.33
Phosphorus (Kg P2o5 Ha -1)						
O (Po)	33.62	1.31	22.64	6.80	12.23	35.73
25(P25)	35.62	1.43	23.38	7.70	12.92	37.34
5O(P 50)	36.79	1.45	23.69	8.35	13.34	38.49
75(P75)	37.60	1.46	23.79	8.71	13.52	39.18
SE(m)+	0.56	0.06	0.34	0.25	0.41	0.15
CD(P=0.05)	1.16	0.14	0.70	0.52	0.84	0.33

Table II interaction b/w nitrogen and phosphorus for seed yield

	Po	P25	P50	P75
No	5.69	6.59	7.24	7.63
N15	6.56	7.46	8.11	8.50
N 30	7.19	8.09	8.84	9.03
N 45	7.76	8.66	9.21	9.70

SE (m)+- = 0.43

CD for N x P = 0.90

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