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Appraisal of lentil varieties for better performance in Bilaspur district of Himachal Pradesh

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Abstract

Lentil (*Lens esculenta*) is commonly known as masur and it is important pulse legume crop in India. Lentil has the ability to fix nitrogen and grow in marginal environments. The productivity of lentil is generally low in Bilaspur district of Himachal Pradesh, mainly due to lack of improved varieties and low technical knowhow. Therefore, the present study was conducted in the seventeen villages of district Bilaspur of Himachal Pradesh. Twenty five farmers' fields were randomly selected and sown two high yielding improved varieties of lentil namely Vipasha and Markandey with one check variety already grown by the farmers. Among the varieties assessed, variety Vipasha proved to be the best with highest number of pods/plant (92.4) and minimum incidence of disease of 1.5 per cent resulting in the highest yield of 6.60 q/ha followed by Markandey with disease incidence of 2.1 per cent, 72.8 pods/plant and yield of 6.1 q/ ha. Hence, it was inferred that local variety must be replaced with Vipasha variety of lentil followed by Markandey.

Key words: Extension gap, lentil, technology, varieties, yield

Lentil is widely grown cool season leguminous pulse crop. Lentil seeds are rich sources of protein, minerals (K, P, Fe, and Zn) and vitamins. Lentil has high lysine and tryptophan content and its consumption with wheat or rice provides a balance of essential amino acids for human nutrition (Bacchi *et al*. 2010). Pulses are the main and cheap source of protein for socially and economically backward classes of India. Lentil plays a pivotal role in improvement of human, animals and soil health and occupiesa unique position in cereal-based cropping systems (Bacchi *et al*. 2010; Yasin 2015). Its ability in nitrogen fixation and carbon sequestration improves soil nutrient status, which ultimately provides sustainability in crop production systems (Abraham 2015; Yasin 2015).

The average productivity of recommended lentil varieties is around 10-12 q/ha but the yield at farmers' level is much less than the average productivity. The main production constraints include the inherent low yielding local cultivar and use of traditional agronomic practices. The participatory rural appraisal study in the district revealed that the farmers were cultivating the local variety of lentil which was low yielding, susceptible to yellow mosaic virus (YMV) and other diseases. Crop growth and yield are low due to poor plant nutrition and erratic rainfall. Inappropriate management is another reason that further reduces soil fertility. Therefore, the study was conducted to evaluate the growth and yield parameters of two selected high yielding varieties of lentil in Bilaspur district. Another objective of the study was to identify and popularize the most suitable variety at the farmer's field for higher income.

Materials and Methods

The present study was conducted in the seventeen villages namely; Sunhani, Mehri, Ropa, Dalta, Khater, Dhaloh, Rudhani, Vijaypur, Railly, Badgaon, Gochar, Sakrer, Deoli, Tanyur, Patta, Amarpur and Niun of district Bilaspur of Himachal Pradesh having the clay loam to silt clay loam soil during *Rabi* 2020-21.

Twenty five farmers' fields were randomly selected and sown two high yielding improved varieties of lentil namely Vipasha and Markandey with one check variety already grown by the farmers. The chemical fertilizer was applied through IFFCO (12:32:16) as basal dose. The details of cultural practices are given in Table1.

The recommended weed control measures and irrigation were applied according to requirement ofthe crop. The data like average plant height, number of branches, number of pods/plant, disease incidence (%), plant stand, 100 seed weight and pod yield (q/ha) were recorded during the investigation.To estimate the technology gap, extension gap and technology index formula given by Samui *et al*. (2000) was used.

Technology gap = Potential yield –Demonstration yield

Extension gap = Demonstration yield –Farmers' yield

Technology index = {(Potential yield –Demonstration yield) / Potential yield} × 100

Yield gap-II= {(Demonstration yield-Check yield) / Demonstration yield} × 100

Results and Discussion

The longest average plant was recorded in the Vipasha variety (36.4 cm) followed by Markandey (31.4) and local check (28.8) (Table2). Vipasha variety of lentil also produced significantly higher average number of main branches (4.8) as well as number of pods per plant (92.4) than Markandey and local check. The reason may be attributed to the genetic variability and varietal difference and environmental adaptability. Yasin (2015) and Kindie & Nigusie (2018) also reported the similar results during the evaluation of lentil.

Higher number of pods per plant might be due to the positive effect of phosphorus application and due to better enzymatic activities which control flowering and pod formation (Kumar and Singh, 2014). Also the disease incidence and plant stand were 1.5 and 2.1 per cent and 85 and 82 percent in Vipasha and Markandey, respectively. Whereas, the local check observed 22.3 per cent disease incidence and only 60 per cent plant stand (Table 2). Markandey resulted in higher 100 seed weight (3.4g) followed by Vipasha (1.7g), which can be attributed to the varietal character as Markandey is bold seeded variety as compared to Vipasha.

The highest average yield of lentil was recorded in Vipasha (6.6 q), which was statistically at par with Markandey (6.1 q) but significantly higher than local check (3.6 q). Thus the local variety/farmers' practice

Table 1. Details of practices in Bilaspur district under FLD programme

S.No.	Cultural Practice	Improved Practices	Existing Practices
1	Variety	Vipasha and Markandey	Local
2	Land Preparation	Ploughing and Leveling	Ploughing and Leveling
3	Pre-emergence herbicide	Pendimethalin @ 2.5 l/ha	No herbicide
4	Seed rate	25 kg/ha	32 kg/ha
5	Seed treatment	Bavistin @ 2.5 g/ kg seed	No seed treatment
6	Fertilizer dose	Integrated Nutrient Management	Indiscriminate use
7	Plant protection	Integrated Pest management	Indiscriminate application

Table 2. Performance of lentil varieties in farmers' field

S.No.	Parameter	Vipasha	Markandey	Local	C.D.(0.05)
1	Plant Height	36.4	31.4	28.8	2.6
2	Number of main branches	4.8	4.4	4.2	0.3
3	Number of pods per plant	92.4	72.8	65.4	8.7
4	Disease Incidence (%)	1.5	2.1	22.3	3.6
5	Plant stand (%)	85	82	60	12
6	100 seed weight (g)	1.7	3.4	1.5	0.7
7	Yield (q/ha)	6.6	6.1	3.6	1.4

may be replaced with high yielding varieties because of higher productivity. Similar findings have been observed by Anuratha *et al*. (2020). The increase in the yield with Vipasha and Markandey varieties were around 83.33 and 69.44 per cent, respectively (Table 3). The technology gap ranged from 5.4 to 3.9 q/ha as given in Table 3. The observed technology gap was due to various constraints such as soil fertility, availability of low moisture content and climatic vulnerabilities etc. Hence, to reduce the yield gap location specific recommendations for varieties, soil testing and timely sowing appears to be necessary. A value of 3.0 to 2.5 q/ha of extension gap was found in lentil that suggested that there is a need to decrease this wider extension gap through latest techniques.These findings were similar to the findings of Kushwah *et al*. (2016) and Anuratha *et al*. (2020). The technology index showed the suitability of varieties at farmer's field. Lower technology values indicated that feasibility of variety among the farmers is more.The technology index and yield gap-II ranged from 45 to 39 per cent and 45.45 to 40.98 per cent, respectively (Table 3). The finding was in accordance to the finding of Sandhu and Dhaliwal (2016).

The gross cost of cultivation was almost similar for both the varieties. Market preference for Vipasha was good and fetched higher price. The gross return, net return and B: C ratio was higher in Vipasha due to higher market price followed by Markandey.

Conclusion

It can be concluded that cultivation of Vipasha and Markandey varieties of lentil in Bilaspur district of Himachal Pradesh is more beneficial due to their yield contributing traits namely plant height, number of branches per plant, number of pods per plant and yield which were recorded more as compared to farmers' choice variety. The yield of Vipasha & Markandey was significantly higher than local check with recommended package and practices of lentil. Thus, the farmer's practice variety may be replaced with high yielding variety in Bilaspur district of Himachal Pradesh.

Conflict of interest: The authors declare that there is no conflict of interest in this research article.

Table 3. Yield Technology gap, extension gap and technology index of lentil

Name of variety	Yield (q/ha)			Percent increase	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)	Yield gap-II
	Potential Yield (q/ha)	Improved Practices	Farmers' Practices					
Vipasha	12	6.6	3.6	83.33	5.4	3.0	45	45.45
Markandey	10	6.1	3.6	69.44	3.9	2.5	39	40.98

Table 4. Economics of demonstrations organized on lentil varieties

Variety	Gross Cost (Rs/ha)	Gross Return (Rs/ha)	Net return (Rs/ha)	B:C ratio
Vipasha	25920	46200	20280	1.78
Markandey	25920	42700	16780	1.65
Local check	20175	30550	10375	1.51

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