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RESEARCH ARTICLE :

Responses of wilt tolerant varieties of lentil under Bundelkhand condition of Uttar Pradesh

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SUMMARY : The adaptive trial was laidout during *Rabi* season with the objective to increase the lentil production with wilt tolerant varieties and replace the old cultivars, which is in vogue. The soil of operational area is *Kabar*, having low fertility status. The wilt tolerant cultivars *DPL-62, K-75* and *PL-406* were tested with local variety, which is popularized among the farming majority. The cultivars were planted in the first fortnight of November and harvested after 128 DAS in the second fortnight of March. The highest average yield of lentil was recorded in cultivar *DRL-62* by 15.75 q/ha, which lowest average seed yield of 13.00 q/ha was recorded in local check, varieties *K-75* and *PL-406* produced grain yield by 14.75 q/ha and 14.00 q/ha, respectively. The yield contributing character were concordance to grain yield of lentil. The maximum BCR 1:2.36 was calculated with cultivar *DPL-62* closely followed by *K-75* (1:2.14). The minimum BCR noted under local check.

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BACKGROUND AND OBJECTIVES

Pulses are rich source of vegetative protein and play an important role in nutritional security of a substantially vegetarian population of India. The pulse crops are invariably grown under risk-prone rainfed environments. Bundelkhand region consisting of 7 districts of Uttar Pradesh and 6 districts of Madhaya Pradesh comes under rainfed farming. The region is considered to be the pulse bowl of Uttar Pradesh as it shares about 50 per cent area and 45 per cent of total pulse production in the state (Anonymous, 2007). However, several constraints cause low productivity in pulses in this region. Soil borne fungal diseases such as *Fusarium* wilt and root rot complex (*Fusarium solani*, *Sclerotium rolfsii*, *Rhizoctonia solani*, *R. bataticola* etc) are causing 10-50 per cent yield losses in farmers field of Bundelkhand region.

Lentil is well recognized pulse crop of country grown in *Rabi* season but littler attention are being paid by farmers on its certification. It is known to be the most nutritious of the pulse and is an important item in the diet of the human. It has been observed that there is shortage of moisture in *Rabi* pulses, while the *Kharif* pulses are sensitive to excess water. Generally the water conserved from *Kharif* mansoon, farmers grow the lentil at this moisture under rainfed

situation.

Lentil (*Lens culinaris* Medik) ranks third in the world after chickpea and pea (FAO, 2015). It is considered as one of the oldest domesticated crop in the Near East based on the archaeological evidence (Cubero, 1981 and Zohary and Hopf, 1973) and is grown as an important food source over the last 8,000 years (Dhuppar *et al.,* 2012 and Oplinger *et al.,* 1990). In India lentil is cultivated on an area of 1.47 million ha with total production of 1.03 million tones. However, its productivity remains low (5.71 q/ha) due to cultivation under biotic and abiotic stresses. Biotic stresses such as fusarium wilt (*Fusarium oxysporum* f.sp. *lentis*), ascochyta blight (*Ascochyta lentis*), stemphylium blight (*Stemphylium botryosum*), anthracnose (*Colletotrichum truncatum*), root rot (*Rhizoctonia solani*), rust (*Uromyces viciae-fabae*), white mold (*Sclerotinia sclerotiorum*) and collar rot (*Sclerotiun rolfsii*), (Kumar *et al.,* 2013 and Sharpe *et al.,* 2013) affect lentil and cause severe yield loss.

Among them *Fusarium* wilt caused by *Fusarium oxysporum* f.sp. *lentis* is one of the major disease affecting lentil all over the world (Bayaa *et al.,* 1998 and Khare, 1981). It was first reported from Hungary (Fleischmann, 1937) for the first time and later on from many countries including India (Padwick, 1941), USA (Wilson and Brandsberg, 1965), USSR (Kotava *et al.,* 1965), Syria (Bayaa *et al.,* 1986) and Turkey (Bayaa *et al.,* 1998). Globally wilt is considered as the most harmful soil borne disease of lentil (Khare, 1981 and Bayaa *et al.,* 1998). *Fusarium oxysporum* f. sp. *lentis* Vasudeva and Srinivasan affect lentil at every growth stage like seed, seedling, flowering and at crop maturity in stem and root which causes seed rot, stem rots, damping off, wilt and root (Khare *et al.,* 1975 and Vasudeva and Srinivasan, 1952). Warm and dry conditions are the most ideal condition for the proliferation of the disease (Bayaa and Erskine, 1990 a and b). In India, fusarium wilt is the major factor limiting lentil production in the states of Uttar Pradesh, Madhya Pradesh, Himachal Pradesh, Bihar, West Bengal, Assam, Rajasthan, Haryana and Punjab (Agrawal *et al.,* 1993 and Chaudhary *et al.,* 2009 and 2010). In India, the incidence of this disease has been reported at seedling, flowering and pod stages at temperature 25°C or above (Kannaiyan and Nene, 1976).

It is fact that farming majority residing in rainfed area, cultivating the lentil as a rainfed crop. This area is about 80 per cent, which is poor in fertility, moisture loss due to hot desiccating wind, lack of improved production technology, economic condition of farmers, use of indigenous varieties, biotic and abiotic factors etc. are responsible for low productivity of this crop.

In Uttar Pradesh, lentil is cultivating on area of 4.38 lakh hectare with total production of 4.71 lakh mt. The productivity of lentil in U.P. is 9.64 q/ha, which is less in comparison to potential yield (Anonymous, 2017). Singh *et al.* (2016) have stated that more than manuring and irrigation, it is the capacity of the variety to withstand the critical period of stress, which the plants have to face during the period of growth. Climatologically, edaphically and socially the Bundelkhand Zone is quite different from other Zones of Uttar Pradesh. It is characterized by semi-arid climate, undulating topography, residual soil of erodible nature, deep water strata underlain with hard impermeable rocks, poor crop husbandry including low fertilizer use and irrigation. The annual precipitation is of the order of 1014 mm which is largely concentrated from mid June to mid September. During rainy season, the residual nature of soil and rocks reduce the infiltration rate and consequently leads to high runoff. Since the irrigation facilities are available only in 30 per cent of the cultivated area and rest of the 70 per cent area is rainfed in this region, the only approach which can take to improvement of dry land agriculture in this zone is rainfed cultivation with improved crop production technology to make efficient use of the available water which include suitable crops and varieties, adequate fertilization, timely operations and wherever necessary putting the land under pulse cultivation. Singh *et al.* (2013) reported from C.S. Azad University of Agriculture and Technology, Kanpur that the adaptive research on farmers field is the pin point for increased the productivity of pulses. In desiccating area of Bundelkhand, farmers cultivate the old varieties at high moisture of soil, under this situation incidence of wilt disease damage the crop at growth stage. Therefore, the wilt tolerant varieties of lentil were tested on farmers fields with full conservation agronomical practices.

RESOURCES AND METHODS

The present adaptive trail was laidout during autumn season of 2002-03 at K.V.K. Rura Mallu, Jalaun. The soil of experimental area was *Kabar*, having pH- 7.8, organic carbon 0.29 per cent, total nitrogen 0.02 per cent, available phosphorus 11.20 kg/ha and available potash 308 kg/ha, therefore, the fertility status of

operational area was low. The pH was determined by Electrometric glass electrode method (Piper, 1950), while organic carbon was determined by Colorimetric method (Datta *et al.,* 1962). The total nitrogen was analysed by Kjenldal's method as discussed by Piper (1950). The available phosphorus and potassium were determined by Olsen's method (Olsen *et al.,* 1954) and Flame photometric method (Singh, 1971), respectively.

Trainings and demonstrations were conducted for generating awareness and enhancing the farmers knowledge and skills. Accordingly, one institutional training cum exposure visit and 26 field training were organized in coordination of state agriculture department and para extension agents. The trainings were participatory in nature where lecture and group discussion were mainly used for transferring the scientific knowledge to the farmers.

The cultivar *DPL-62,K-75, PL-406* were compared with local at two locations *i.e.*, *Ingoi* village of Nadigaon block and *Chani* village of Konch block of Jalaun district. All the recommended package of practices was followed in adaptive trail. The crop was raised under dry land condition and no irrigation was given to each. The crop was planted in the first fortnight of November, 2002 and harvested in the second fortnight of March 2003 after 128 days of sowing. The essential dryland agronomical practices were also followed as suggested by Singh *et al.* (2013).

OBSERVATIONS AND ANALYSIS

The average data obtained from the two location adaptive trial of lentil are reported in Table 1 and discussed here under.

Perusal of data make it clear that cultivar *DPL-62* registered higher branches/plant (6.43) followed by *K-75* (6.15). cultivar PL-406 produced branches/plant by 6.00. the all wilt tolerant cultivars produced higher branches/plant over local cultivar (5.30). the maximum pod length was measured by 2.25 cm in cultivar DPL-62 followed *K-75* (2.10 cm), *PL-406* (2.08 cm) and ,ocal (2.07 cm). the maximum pods/plant (46.60) was counted in improved cultivar *DPL-62*, which *K-75, PL-406* and local produced pods/plant by 45.90, 45.45 and 43.00, respectively. The similar trend was also noted in seeds/pod. The highest seeds/pod was noted by 1.75 in cv. *DPL-62*, while lowest seeds/pod bu 1.71 was counted under local check. The remaining two varieties produced number of seeds/pod between these two limits.

The highest average yield (q/ha) of lentil was recorded in cultivar *DPL-62* (15.75 q/ha), while lowest average seed yield of 13.00 q/ha was recorded in local check. cultivar *K-75* and *PL-406* yielded grain yield by 14.75 q/ha and 14.00 q/ha, respectively under moisture stress condition. There had been considerable increase in branches/plant, pods/plant, pods length/ plant, seeds/pod in cultivar *DPL-62* sown under moisture stress condition over other genotypes that contributed to increase the seed yield (q/ha). These results are in agreement with those reported by Singh *et al.* (2013).

The cultivar *DPL-62* of lentil maintained under dry land condition under this situation the dry matter or photosynthates produced source organs translocated towards sink organ (economic part) and produced higher seed yield of lentil. The sowing of cv. *DPL-62* of lentil had higher number of pods/plant and seed/pod, means it possessed higher sink capacity to utilized the photoassimilates translocated from source, resulted in more seed yield (q/ha). These results confirm the findings of Panwar *et al.* (1986); Shrivastava and Bharadwaj (1986); Pachpor and Shete (2010); Singh *et al.* (2015); Singh *et al.* (2015) and Singh *et al.* (2016). The maximum BCR of 1:2.36 was computed with genotype *DPL-62* closely followed by K-75 (1:2.14). the minimum BCR noted with local (1:1.72).

Table 1: Growth, yield parameters, yield BCR obtained from lentil (average data of two locations)

Sr. No.	Variety	Branches/ plant	Pods length (cm)	Pods/ plant	Seeds/ pod	Seed yield (q/ha)	BCR
1.	Local	5.30	2.07	43.00	1.71	13.00	1:1.77
2.	*DPL-62*	6.43	2.25	46.60	1.75	15.75	1:2.3
3.	*K-75*	6.10	2.10	45.90	1.73	14.75	1:2.14
4.	*PL-406*	6.00	2.08	45.45	1.73	14.00	1:1.98

Conclusion:

The cultivar *DPL-62* produced higher grain yield under rainfed condition on Bundelkhand, therefore, farming majority may be advocated for adoption of this variety. But in the paucity of seed the cultivars *K-75* and *PL-406* may also be grown in dry land area.

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