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Response of lentil genotypes to planting geometry

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Abstract
The experiment was conducted at Main Agricultural Research Station (MARS), University of Agricultural Sciences, Dharwad during the winter season of 2015 under rainfed condition. The treatments comprised of 7 genotypes *viz*., Belgaum local, Kittur local, IPL-316, WBL-58, WBL-77, HULL-57, KLS-218 and two planting geometries *viz*., 20 cm x10 cm and 30cm x10 cm. between the planting geometries, narrow spacing of 20 x 10 cm was found better than 30 x 10 cm. Among the genotypes local genotypes like Belgaum local (694 kg/ha) and kittur local (697 kg/ha) proved better than other genotypes (347 to 596 kg/ha).

Keywords: lentil genotypes, planting geometry, agricultural

Introduction

Lentil (*Lens culinaris* Medikus subsp. *Culinaris*) is one of the important pulse crop grown in India. Lentil does best in cool temperate zones, or in the winter season. Global lentil production in 2009 was 4.5 million metric tons, the top producers being Canada, India, Turkey and the United States. India has got 1.48 million hectare area with production of 1.03 million tones and productivity of 697 kg/ha for the lentil crop. Importance of lentil as a pulse crop is well documented since times immemorial due to its role in food, feed and farming systems of India. Its seeds contain high quantity and quality protein along with essential minerals and vitamins; high lysine content in its seed complements the low lysine in cereal proteins. Its less cooking time compared to other pulses made lentil more popular in the fuel-deficient developing countries like India. Lentil is also a key commodity crop in crop diversification and intensification programmes in the country. Additionally lentil plays a great role in various national and international programmes which are working to improve soil health status with balanced nutrition to provide sustainable crop production systems. In Karnataka it is grown in Belgaum district and drill sown paddy fallows of Zone 8 and 9. Even though it is being grown by farmers since several years, there is no improved variety, recommended spacing and fertilizer dose to achieve higher yield in this crop. Appropriate crop management seems to be one of the key factors to realize optimum yield at farm level. Among several management options, planting geometry and nutrient management are of great importance to realize higher yield. Too low and high plant population beyond a certain limit often adversely affects the crop yield. Number of plants per unit area influences plant size, yield components and ultimately the seed yield (Beec and Leach 1989) [1]. Moreover, plant spacing in the field is also very important to facilitate aeration and light penetration in to plant canopy for optimizing rate of photosynthesis. Optimum plant population density is an important factor to realize the potential yields as it directly affects plant growth and development. Many studies show that lentil yields are remarkably stable over a wide range of population densities. The plants are able to fill available space by initiating lateral branches and, thus, can compensate for poor emergence and thin stands (Morrison and Muehlbauer 1986) [3]. Selim (1999) [4] found that lentil yield increased up to 300 plants/m^2 after which it decreased. Seed rate is one of the main factors that have an important role on growth, yield and quality of lentil. Optimum spacing can ensure proper growth of the aerial and underground parts of the plant through efficient utilization of solar radiation, nutrients, water, land as well as air spaces. Spacing for line sowing is recommended to maintain the required number of plant population and to undertake intercultural operations for harvesting a higher yield. It has been observed that low plant population and low yielding genotypes are the main reasons for lower productivity in farmer's fields. Hence this study was conducted with the objective to find out optimum planting geometry for lentil genotypes.

Material and Methods

The experiment was conducted at Main Agricultural Research Station (MARS), University of Agricultural Sciences, Dharwad during the winter season of 2015 under rainfed condition. The geographical co-ordinates of Dharwad are 15°26' N latitude and 75°7' E longitude and an altitude of 678 m above mean sea level. It is located in the Northern Transition Zone of Karnataka which has semi-arid climate. The soil of the experimental site was clayey in nature and having available N, P and K of 213, 21.5 and 325.8 kg/ha, respectively. Organic carbon (%) and pH of the soil were, respectively, 0.52% and 7.2.The treatments comprised of 7 genotypes *viz*., Belgaum local, Kittur local, IPL-316, WBL-58, WBL-77, HULL-57, KLS-218 and two planting geometry *viz*., 20 cm x 10 cm and 30cm x 10 cm. All the genotypes were sown on 16-10-2015 and provided with 25:50:0 kg of N: P_2O_5:K_2O/ha. Plant protection and weed management were followed as per the university recommendation. Three irrigations were given to support crop establishment, flowering and pod development.

Results and Discussion

Among the planting geometries, narrow spacing of 20 x 10 cm recorded significantly higher yield (563 kg/ha) than 30 x 10 cm (502 kg/ha).The per cent increase in yield was 12.15%. Which was attributed to lower plant population in 30x10 cm (333333 plants/ha) compared to 20x10 cm (500000 plants/ha). Ashiq Saleem *et al*., (2012) reported that low plant populations are unable to utilize the resources efficiently and often produce low yields. These results are in similar line with that of Singh *et al.,* (2005) who also obtained higher yield of lentil with 20 cm spacing.

Even though biomass obtained per plant was higher in 30x10 cm (9.62g) than 20x10 cm (8.45g), biomass obtained per unit area in 30x10 cm planting geometry was lower compared to 20x10 cm planting geometry due to lower population. Lentil needs low temperature (<10^{o}C) during its initial growth period which was not achieved in this experiment which was conducted in Northern Transition Zone of Karnataka where temperatuture in winter months will be >12^{0}C, hence biomass was less in all the treatments. Among the genotypes local genotypes like Belgaum local (694 kg/ha) and kittur local (697 kg/ha) proved significantly superior over other genotypes (347 to 596 kg/ha). The higher yield in these genotypes was due to higher number of pods per plant (68.35 and 72.25 respectively) over other genotypes (39.9-53.2).These local genotypes achieved better yield compared to other improved genotypes as they were adopted to the climatic condition of this region and achieved higher biomass under existing conditions. Interacion was not significant.

Table 1: Yield, number of pods/plant and total dry matter/plant as influenced by genotypes and planting geometry

Genotypes	Yield (kg/ha)			No. of pods/plant			Total dry matter/plant		
	20X10 cm	30 X 10 cm	Mean	20X10 cm	30 X 10 cm	Mean	20X10 cm	30 X 10 cm	Mean
Belgaum local	706	682	694	64.40	72.30	68.35	9.79	11.21	10.68
Kittur local	705	689	697	69.20	75.30	72.25	8.86	9.95	9.35
IPL-316	518	431	475	43.70	47.49	45.60	7.87	8.55	9.07
WBL-58 (Subrata)	603	590	597	52.30	54.20	53.25	9.41	9.76	10.28
WBL-77 (Moitri)	483	462	473	46.15	49.84	48.00	8.67	10.23	9.45
HULL-57	478	411	445	43.83	46.50	45.17	7.89	9.99	8.94
KLS-218	446	248	347	37.20	42.60	39.90	6.70	7.67	7.51
Mean	563	502		50.97	55.46		8.45	9.62	
	Genotypes (G)	Spacing (S)	Interaction(GxS)	Genotypes(G)	Spacing (S)	Interaction (GxS)	Genotypes(G)	Spacing (S)	Interaction(GxS)
SEm±	25	15	43	1.95	1.3	4.26	0.50	0.30	1.6
CD at 5%	75	45	NS	5.7	3.9	16.8	1.5	0.9	NS

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