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Harshika Tiwari
Department of Agronomy, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

DK Chandrakar
Department of Agronomy, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Sunil Kumar
Department of Agronomy, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Nitish Tiwari
Department of Agronomy, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Aditya Swarnkar
Department of Agronomy, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Ankita Dewangan
Department of Agronomy, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Keval Kumar Sahu
Department of Agronomy, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Corresponding Author:
Harshika Tiwari
Department of Agronomy, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

To workout the economics of lentil production under delayed planting condition in vertisol of Chhattisgarh plains

Harshika Tiwari, DK Chandrakar, Sunil Kumar, Nitish Tiwari, Aditya Swarnkar, Ankita Dewangan and Keval Kumar Sahu

Abstract
The field experiment was conducted at Instructional-cum-Research Farm, IGKV, Raipur, (C.G.) during *rab*i 2020-21, to work out the economics of lentil production under delayed planting condition. The genotype RKL58F3715 gave the highest gross realization (Rs. 81472/ ha), net realization (Rs. 63075 /ha) and B:C ratio (3.43). The highest economical gross return (Rs. 77011/ ha), net return (Rs. 58618/ ha) and B:C ratio (3.19) was noted under 20th November date of planting. Genotype RKL58F3715 in combination to 20th November date of planting reported significantly higher net realization (Rs. 81946 ha^{-1}) being on par to CG Masoor 1 (Rs. 80091 ha^{-1}) sown on 20th November date of planting over rest of the treatment combinations.

Keywords: Agriculture, cost, field, genotype, production, November

Introduction
Pulses rank as the 2nd most important food crops followed by cereals and are the main source of vegetable protein. India stands as the largest producer and consumer of pulses globally encompassing 33% of the global area and 22% of the global production. The area under pulses in India during 2019-2020 is around 279.9 lakh ha with total production of 230.3 lakh tonnes and average productivity of 823 kg ha^{-1}. The area under lentil in Chhattisgarh state is around 138 hundred ha with total production of 45 hundred tonnes and average yield of 323 kg /ha. Although, India being the prime pulse crop growing country in the world, however, pulses contributed only 6-7% to total food grain production of the country. Pulses supplied protein, energy, dietary fibre, vitamins and minerals required for human health. It supplies 25 percentages of protein requirements of mostly vegetarian population and 14 per cent of total protein of an Indian diet. In comparison to other vegetables, pulses are wealthy in protein and contribute about 10 per cent of protein intake in daily basis and 5% of energy intake.
Lentil (*Lens culinaris* Medik.) is one of the most important pulse crops. It is usually consumed as a seed (full decorticated, decorticated and split). It is also processed into flour to make variety of dishes. In Indian sub-continent, it is generally ingested as *daal* (seeds boiled and mashed into soup). It is also utilized in making of various types of snacks and sweets. The straw has also high nutritive value. De-hulled lentil seeds contain 25 to 26% protein, 1.2-1.3% fat, 3.2% fibre and 55-57% carbohydrate. It is having good content of Ca (68 mg 100 g $seed^{-1}$), P (300 mg100 g $seed^{-1}$) and Fe (7 mg100 g $seed^{-1}$). It is also abundant in vitamin C and riboflavin.
The planting date is the key factor of productivity as it directly influences lentil growth and development through environmental modifications and photo-thermo-sensitive effects. In conditions of delayed planting, the growing season, especially from flowering to maturity, is shortened due to the accelerated maturation of the crop. Consequently, late-planted lentil crops exhibit decreased yields compared to those planted timely. Understanding how different varieties respond to planting dates is of paramount importance, given that cultivars exhibit varying growth and development behaviours in distinct agro-ecological conditions. In India, the majority of lentil plantings experience delays because of late harvesting of the preceding *kharif* crop, often paddy. Consequently, when lentils are cultivated after paddy in the *kharif* season, farmers may struggle to sow a summer crop on schedule. Additionally, the lentil crop is susceptible to heat stress during the seed-filling stage in many cultivated areas, leading to reduced yields.

With the growing season being significantly shortened, the adoption of early-maturing cultivars becomes crucial in India. Extra-early lentil varieties have the potential to enable the cultivation of an additional crop in the succeeding season, addressing concerns about potential yields. (Mandi *et al.* 2015) [6].

The optimal date for sowing aids in determining the best period for germination, establishment and canopy development (Bussmann *et al.* 2016 and Dennett *et al.* 1999) [2, 4]. The early planted crop exhibits vigorous growth, but this is later followed by a decrease in both pod and seed production, ultimately constraining overall yield. Late sowing also results in a poor productivity, slowed growth, and a shorter seed development period (Girma *et al*. 2017 and Mubvuma *et al*. 2015) [5, 7].

Materials and Methods

The experiment "Performance of lentil genotypes under delayed planting condition in *Vertisols* of Chhattisgarh plains" was performed at Agriculture Instructional-cum-research Farm, IGKV, Raipur, (C G) during *rabi* season 2020-21. The region experiences a sub-humid to semi-arid climate, while the experimental plot consisted of *Vertisols* characterized by varying levels of N, P_2O_5, and K_2O ranging from low to high, and maintained a neutral pH. The experiment was carried out in the Factorial Randomized Block Design (FRBD) with 3 replications. The treatments consisted of 3 planting time *viz*. D_1: 20th November (timely), D_2: 30th November (late) and D_3: 10th December (very late) and five genotypes *viz*. V_1: JL-3, V_2: RKL58F3715, V_3: L-4076, V_4: CG Masoor 1 and V_5: DPL-62. Lentil genotypes were sown on 20th November, 30th November and 10th December, 2020 and harvested on 6th March and 11th March, 2021. During crop growth period various yield attributing parameters like pods/ plant, seeds/ pod, seed index, seed and stover yield were taken as per plan and requirement of study.

Results and Discussion

Among the genotypes, RKL58F3715 gave significantly maximum gross realization (Rs. 81472/ ha), net realization (Rs. 63075/ ha) and benefit cost ratio (3.43) followed by CG Masoor 1 and L-4076. The cultivation of DPL-62 was the matter of risk as it gave estimates of losses. Similar result were noted by Deka *et al.* (2015) [3], Yadav *et al.* (2017) [12], Singh *et al.* (2019) [11] and Mule *et al.* (2020) [8].

The data reveals that the maximum gross realization (Rs. 77011 /ha), net realization (Rs. 58618 /ha) and benefit cost ratio (3.19) was obtained under 20th November date of planting. As the planting is delayed, net realization from the cost goes on decreasing. 10th December date of planting was observed to be an enterprise of loss. Deka *et al.* (2015) [3], Samant and Mohanty (2017) [10], Yadav *et al.* (2017) [12], Singh *et al.* (2019) [11], Amarjeet *et al.* (2020) [1] and Mule *et al.* (2020) [8].

Net realization (Rs. /ha) of lentil as affected by interaction between date of planting and genotypes is presented in Table 2. Genotype RKL58F3715 sown up to 20th November fetched significantly maximum net realization (Rs. 81946 /ha) closely followed by CG Masoor 1 (Rs. 80091/ ha) over rest of the treatment combinations.

Interaction effects were obtained to be significant for different date of planting among all the genotypes under observation.

Table 1: Economics of lentil crop as influenced by genotypes and date of planting

Treatment	Cost of cultivation (Rs. /ha)	Gross realization (Rs. /ha)	Net realization (Rs. /ha)	B: C ratio* (Rs. /ha)
Genotypes JL 3	18387	56125	37738	2.05
RKL58F3715	18387	81472	63075	3.43
L4076	18387	58340	39953	2.17
CG Masoor 1	18387	72746	54359	2.96
DPL 62	18387	47561	29174	1.59
SEm±		2432	2433	0.13
CD (P=0.05)		7044	7046	0.38
Date of planting 20 November	18387	77011	58618	3.19
30 November	18387	63774	45387	2.47
10 December	18387	48961	30574	1.66
SEm±		1884	1884	0.10
CD (P=0.05)		5457	5458	0.30

* B: C ratio was calculated on the basis on Net realization

Table 2: Net return of lentil crop as influenced by interaction between date of planting and genotypes

Treatment	Date of planting			Mean
	20 November	30 November	10 December	
Genotypes				
JL 3	38588	32359	42267	37738
RKL 58F3715	81946	64137	43141	63075
L 4076	47051	48787	24021	39953
CG Masoor 1	80091	61726	21259	54359
DPL 62	45415	19926	22180	29174
Mean	58618	45387	30574	
		Genotypes	Date of planting	Interaction
SEm±		2433	1884	4214
CD (P=0.05)		7046	5458	12204

Conclusion

The genotype RKL58F3715 gave the highest gross realization (Rs. 81472 /ha), net realization (Rs. 63075 /ha) and benefit: cost ratio (3.43). The highest gross realization (Rs. 77011 /ha), net realization (Rs. 58618 /ha) and benefit: cost ratio (3.19) was noted under 20th November date of planting. Genotype RKL58F3715 in combination to 20th November date of planting reported significantly higher net realization (Rs. 81946 ha^{-1}) being on par to CG Masoor 1 (Rs. 80091 /ha) sown on 20th November date of planting over rest of the treatment combinations. These findings highlight the importance of considering the optimal combination of planting dates and genotypes for maximizing both grain yield and economic profitability in agricultural practices. Farmers and researchers can use these results to make informed

decisions and enhance productivity in crop cultivation.

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