

## Performance of short duration lentil genotypes in the rice fallows of new alluvial zone of West Bengal

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(Received : February 03, 2019 ; Accepted : March 26, 2019)

### ABSTRACT

Lentil (*Lens culinaris* Medikus) is a potential *Rabi* pulse of rice fallows of New Alluvial Zone of West Bengal. Terminal drought stress is the major problem in the crop grown by using residual soil moisture. Hence, identification of suitable high yielding short duration lentil variety is desirable. Aiming at this, a field experiment was carried out during 2015-16 and 2016-17 to study the performance of 15 lentil genotypes and comparing them with popularly grown variety of the region. The experiment was laid out in randomized block design at district seed farm, AB block, Kalyani, Bidhan Chandra Krishi Viswavidyalaya, West Bengal, India during *Rabi* season. Pooled values of two years data indicated that the genotype L 1112-18 initiated flowering earlier (41.5 DAS) as well as first to achieve 50% flowering (48 DAS) whereas, L 1112-10 achieved 100% flowering (57 DAS) and matured earlier (91 DAS) among the genotype tested. The genotype L 1112-6 produced maximum yield (1619 kg ha<sup>-1</sup>) by attributing higher number of primary branches per plant (4), pods per plant (104.7), 100 seed weight (2.8 g). Based on the yield and earliness, L 1112-8 and L 1112-20 can be used in breeding programme in rice-fallow areas of West Bengal.

**Key words:** Lentil genotypes, Phenology, Yield

The vast rice fallow land of India which is about 11.7 mh can be utilized for growing short duration *rabi* pulse crops which will increase the cropping intensity as well as productivity. Taking a short duration winter pulse crop followed by *kharif* rice by using the residual soil moisture with one or two life saving irrigation (if needed) cause increased pulse production and cropping intensity through the conversion of mono cropped areas to double cropped area. Pulse production should be increased at a rate of 1.86 % against 0.6% (current rate) to fulfill the domestic requirement of the nation by 2050 (Jopir *et al.* 2017). Lentil (*Lens culinaris* Medikus) is one of the important *Rabi* pulse grown in India. It is cultivated as a sole crop utilizing the residual soil moisture left in the soil after harvesting of the rice crop (Ali *et al.* 2012). Though Lentil has bountiful benefits regarding soil and human health, its production and productivity is very low as compared to other countries, which may happen due to its cultivation in very

marginal environment, lack of resources (Tyagi and Khan 2011) and various biotic, abiotic and socio-economic constraints (Ghosh *et al.* 2012). Terminal moisture stress in the later stages of crop growth is the major problem in case of late maturing lentil varieties which can be mitigated by growing early maturing ones in rice fallow (Erskine *et al.* 2011). Among the leading pulse producing states West Bengal is one that contributes 6.71 % area and 6.57% production of pulses in the country (GOI 2017-18). The vast rice fallows of lower gangetic region of West Bengal can be utilized to grow suitable lentil varieties followed by rice. The important approach for crop intensification in this area is identification of adaptable high yielding and short duration varieties first. In view of the above mentioned matters Indian Agricultural Research Institute, New Delhi, in association with Bidhan Chandra Krishi Viswavidyalaya, West Bengal has started on developing suitable varieties of different pulses including lentil and field trials has been carried out in farmers fields to promote these improved varieties among the farmers. The present study was made to evaluate the suitable genotype of Lentil among the fifteen genotypes in the new alluvial zone of West Bengal by comparing them with a popularly grown check variety of this region through assessing variation in phonological development and yield of Lentil.

### MATERIALS AND METHODS

The experiment was carried out during *Rabi* season of two consecutive years 2015-16 and 2016-17 at the District Seed Farm, AB block, Kalyani, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal, India. The land is referred as fertile alluvial soil under Gangetic basin (Order: Inceptisol), which belonged to the class of sandy loam with medium fertility, almost neutral in reaction, organic carbon 0.49%, available nitrogen 225.25 kg ha<sup>-1</sup>, phosphorus 25.81 kg ha<sup>-1</sup> and potassium 187.55 kg ha<sup>-1</sup>. The experiment was laid out in randomized block design involving 16 cultivars that includes 15 lentil genotypes (L 1112-6, L 1112-7, L 1112-8, L 1112-9, L 1112-10, L 1112-11, L 1112-12, L 1112-13, L 1112-14, L 1112-15, L 1112-16, L 1112-17, L 1112-18, L 1112-19, L 1112-20) and check variety Subrata which were replicated thrice. The genotypes are provided by

Department of Genetics, IARI, New Delhi to test under the rice fallows of West Bengal in residual soil moisture condition. The seeds were sown in rows of 25 cm apart with a plot size of 4 m × 3 m area after harvesting of *aman* rice. Fertilizer was applied at the time of land preparation @ 20:40:40 kg ha<sup>-1</sup> N: P<sub>2</sub>O<sub>5</sub>: K<sub>2</sub>O. The data on phenological development and yield attributes were recorded from 5 plants, selected randomly from each plot after harvest of crop.

## RESULTS AND DISCUSSION

The result of the present study showed that the phenological stages of lentil varieties *i.e* flower initiation, 50% flowering, 100% flowering and days to maturity varied significantly from each other (Table 1). The genotypes initiated flower within 41-73 DAS and 42-70 DAS during 2015-16 and 2016-17 respectively. The lentil genotype L 1112-18 has taken minimum days to attain flowering (41.5

DAS) and 50% flowering (48 DAS) and L 1112-7 took maximum days to initiate flower (70 DAS). Whereas, L 1112-10 was the first ever among the genotypes evaluated to attain 100% flowering (57 DAS) and mature (91 DAS). L 1112-9 reached 50% flowering (82 DAS) and 100% flowering (92 DAS) most lately. Most of the genotypes mature within 91-106 days but L 1112-6 (114 DAS), L 1112-7 (113 DAS), L 1112-9 (111 DAS) and L 1112-19 (118 DAS) took comparatively more days to mature.

The yield and yield components varied significantly among the fifteen different genotypes of lentil. The number of primary branches varied between 2.4 to 4 in genotype L 1112-6 and L 1112-20 respectively. The maximum no of primary branches (4.0) obtained with the genotype L 1112-6 followed by L 1112-7, L 1112-18 and Subrata, while minimum no of branches were obtained with L 1112-20. The no of pods per plant was highest in L 1112-6 (104.7) followed by L 1112-7 (98.9), L 1112-8 and Subrata. Seed weight pointed

**Table 1. Phenological characters of different lentil genotypes**

Genotypes	Days to flower initiation			Days to 50% flowering			Days to 100% flowering			Days to maturity		
	2015-16	2016-17	pooled	2015-16	2016-17	Pooled	2015-16	2016-17	Pooled	2015-16	2016-17	pooled
L 1112-6	64.0	67	65.500	84	74.5	79.250	96.0	85.0	90.500	120.5	107.5	114.000
L 1112-7	72.5	69	70.750	84	74.5	79.250	90.0	82.5	86.250	118.5	104	111.250
L 1112-8	57.5	55.5	56.500	71	60	65.500	77.5	67.5	72.500	119.0	88	103.500
L 1112-9	53.0	70	61.500	87	76	81.500	96.0	88	92.000	118.5	103.5	111.000
L 1112-10	43.5	42.5	43.000	47.5	49	48.250	56.0	57.5	56.750	93.0	89.5	91.250
L 1112-11	44.5	46.0	45.250	53.0	54	53.500	65.5	64.5	65.000	102.0	96.5	99.250
L 1112-12	41.0	47.5	44.250	53.5	57	55.250	63.5	66.5	65.000	100	99	99.500
L 1112-13	41.0	45.5	43.250	49	52.5	50.750	63.0	65	64.000	102.5	104.5	103.500
L 1112-14	55.0	56.0	55.500	63	65.5	64.250	72.0	77	74.500	105	98	101.500
L 1112-15	54.0	45.5	49.750	64.5	57	60.750	80.0	75.5	77.750	110	101	105.500
L 1112-16	41.5	43.0	42.250	52.5	53.5	53.000	65.5	67.0	66.250	91	95.5	93.250
L 1112-17	57.5	61.5	59.500	68.0	73.5	70.750	76.0	83.0	79.500	104	106.0	105.000
L 1112-18	41.0	42	41.500	48.5	47.5	48.000	60.5	59	59.750	92.5	94.5	93.500
L 1112-19	61.0	62	61.500	76.0	74.5	75.250	86.5	85.5	86.000	117	118.5	117.750
L 1112-20	53.0	56	54.500	61.0	64.5	62.750	77.0	79.5	78.250	106.5	105.0	105.750
Subrata	63.0	61.5	62.250	75.0	72.5	73.750	83.0	81.5	82.250	101.5	100.0	100.750
SEm (+/-)	2.33	0.78	2.700	1.41	0.67	2.898	1.36	0.60	2.681	1.23	0.47	4.593
C.D. (0.05)	4.76	1.60	8.214	3.03	1.36	8.814	2.91	1.24	8.155	2.64	0.96	13.972

**Table 2. Yield and yield attributes of different lentil genotypes**

Genotypes	Primary branches per plant			No. of pods per plant			100 seed weight (g)			Yield (kg ha <sup>-1</sup> )		
	2015-16	2016-17	Pooled	2015-16	2016-17	Pooled	2015-16	2016-17	pooled	2015-16	2016-17	Pooled
L 1112-6	4.3	3.7	4.0	113.5	95.9	104.7	2.9	2.6	2.8	1,516	1,723	1,619
L 1112-7	3.6	3.7	3.7	105.5	92.4	98.9	2.1	1.6	1.9	1,494	1,584	1,539
L 1112-8	2.7	2.9	2.8	88.4	72.6	80.5	3.0	3.0	3.0	1,588	1,553	1,570
L 1112-9	2.1	3.7	2.9	86.3	85.3	85.8	1.6	1.5	1.6	1,416	1,169	1,293
L 1112-10	2.8	3.2	3.0	82.0	75.8	78.9	2.1	1.9	2.0	950	1,389	1,169
L 1112-11	2.6	3.0	2.8	57.6	70.9	64.2	1.6	2.0	1.8	881	1,113	997
L 1112-12	3.0	3.0	3.0	94.5	89.2	91.8	2.3	2.2	2.3	1,081	1,310	1,195
L 1112-13	2.6	4.1	3.4	60.0	73.3	66.6	2.1	2.0	2.1	920	1,469	1,194
L 1112-14	2.6	2.4	2.5	77.6	71.7	74.6	2.3	2.8	2.6	1,201	1,311	1,256
L 1112-15	2.3	3.0	2.7	74.2	73.7	74.0	2.0	1.7	1.9	1503	1,128	1315
L 1112-16	2.2	4.0	3.1	54.0	62.8	58.4	1.6	1.4	1.5	829	1,185	1,007
L 1112-17	2.3	2.6	2.5	74.5	75.6	75.0	2.8	2.4	2.6	1,291	1,395	1,343
L 1112-18	3.6	3.3	3.5	68.2	70.2	69.2	2.1	1.8	2.0	1,036	1,176	1,106
L 1112-19	2.9	3.4	3.2	92.2	90.1	91.1	2.7	2.6	2.7	1,440	1,490	1,465
L 1112-20	2.1	2.8	2.5	74.4	75.3	74.9	2.2	1.9	2.1	1,491	1,399	1,445
Subrata	2.8	4.1	3.5	82.2	79.1	80.7	1.7	1.8	1.8	1629	1,570	1,599
SEm (+/-)	0.57	0.24	0.36	1.69	1.84	4.52	0.17	0.04	0.13	60.23	90.09	119.51
C.D. (0.05)	1.23	0.49	N/A	5.12	5.61	13.74	0.37	0.08	0.41	183.22	274.04	363.54

out the seed boldness of the genotypes. Among the fifteen genotypes, L 1112-8 (3.0g), L 1112-6 (2.8g), L 1112-19 (2.7g) and L 1112-17 (2.6g) were macro-sperma or bold seeded type and L 1112-16 (1.5g) and L 1112-9 (1.6g) were micro-sperma or small seeded type. The productivity of the 15 genotypes differed significantly to the tune of 829-1588 kg ha<sup>-1</sup> and 1113-1723 kg ha<sup>-1</sup> during 2012-13 and 2013-14 respectively. Number of pods per plant is the most important yield determining character of pulse crop hence maximum yield was obtained with L 1112-6 (1619 kg ha<sup>-1</sup>) which is statistically at par with check variety Subrata (1599.25 kg ha<sup>-1</sup>) and genotype L 1112-8 (1570 kg ha<sup>-1</sup>) and L 1112-7 (1538.5 kg ha<sup>-1</sup>) whereas, L 1112-11 produced minimum yield (997 kg ha<sup>-1</sup>). Higher no of pods per plant and seed index resulted higher yield in lentil and this kind of result was also reported by Layek *et al.* (2014), Layek *et al.* (2013) and Maurya and Rathi (2000). Hence, seed yield being the most important crop characteristics (Tickoo *et al.* 2005), from the above result it was found that the genotypes with higher yield can be grown after harvesting *kharif* rice in the New Alluvial Zone of West Bengal. From the present study it can be concluded that the genotype L 1112-8 and L 1112-20 showed promising potential in the rice fallows of the new alluvial zone of West Bengal not only due to its higher yield which is at par with the check variety, but also its shorter duration have an added advantage on the receding soil moisture regime which can escape terminal heat stress.

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