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Effect of Sowing Time, Tillage and Variety on Growth, Nodulation Pattern, Yield Parameters and Grain Quality of Lentil (*Lens culinaris*) Grown After Monsoon Rice in Lower Gangetic Plains of West Bengal

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ABSTRACT

Crop performance generally depends on proper management practices along with supply of quality seeds of suitable variety. A field experiment was conducted at District Seed Farm, Bidhan Chandra Krishi Viswavidyalaya, Kalyani, West Bengal during the consecutive two *rabi* seasons of 2019-20 and 2020-21 to access the impact of sowing time, tillage operation and variety on the growth indices, nodulation pattern as well as profitable good quality production in lentil grown under residual moisture in post-rice soil. The investigation was laid in a split-split plot design with 3 replications comprising two different sowing condition (early November sowing after harvesting of short duration *kharif* rice and late November sowing after harvesting of long duration *kharif* rice) in main plots, three different tillage operations (relay cropping, zero tillage and conventional tillage) in sub plots and two different varieties (short duration 'L4717' and long duration 'Moitri') in sub-sub plots. The results of the study indicated significant influence of sowing time, tillage operations and varietal duration on lentil in lower gangetic plains of West Bengal. Different growth indices like plant height and aerial dry biomass at maturity, number of nodules plant^{-1} and dry weight of nodules plant^{-1} at 45 and 60 DAS indicated superiority of early sown zero tilled short duration variety in comparison to other treatments applied in the study. The yield parameters of lentil like number of pods plant^{-1}, number of seeds pod^{-1}, test weight which ultimately attributed to superior seed yield in 2019-20 and 2020-21 of lentil at lower gangetic plains of West Bengal. Crude protein content (%) was also found to attain higher values in the aforesaid combination used in the investigation. Therefore, short-duration lentil cultivars in combination with early sowing in the zero-tillage system are the best agronomic approach for the sustainability of lentil production after the monsoon rice harvest.

Keywords : Growth, lentil, nodulation, protein, sowing time, tillage, variety, yield

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Introduction

The biggest problem faced by present day agriculture in the 21st century is ensuring the food and nutritional security for the burgeoning billions. A developing country like India with 41.6% of its population living below international poverty line (Chen and Ravallion, 2010) depends majorly on rice, wheat, and food legumes to meet the carbohydrate and protein nutrition among the citizens. Various grain legumes have profound importance for meetinag food requirements as they are primary plant protein sources. Besides being a rich source of proteins and essential amino acids, they also help in improving soil fertility through biological nitrogen fixation (BNF) in symbiotic association with *Rhizobium* bacteria present in their root nodules (Pooniya *et al.*, 2015). In addition, pulses have also health benefitting properties which help in preventing illnesses such as cancer (Vohra *et al.,* 2015), diabetes and heart disease (Ramdath *et al.,* 2016). Inclusion of legumes in the cropping systems is a proven way of enhancing crop yield and nutrient use efficiency by the plants.

India, a country with high congregations of poor and malnourished people, has continuously promoted a cereal-centric diet composed of subsidized staples such as rice and wheat. But, today, the dietary patterns are changing. Policy makers, researchers, and health activists are looking for ways to fight malnutrition in the country and not just hunger. Thus, neglected food crops like different pulse crops which are generally cultivated under rainfed and energy starved conditions, mostly on marginal and sub-marginal land, are gaining popularity. The important pulse crops of our country are lentil, pigeonpea, mungbean, urdbean, lentil and fieldpea (Ali and Gupta, 2012) which are integral part of the different cropping systems for sustainable agriculture. Among the various cool season food legumes (CSFLs), lentil is a versatile and profitable oldest domesticated pulse crop of the world. It is an excellent source of complex carbohydrates, protein, minerals, vitamins, and dietary fibre for humans, and valuable feed and fodder for livestock (Ninou *et al.,* 2019). It is grown on 1.51 million ha, producing 1.56 million tons (1,032 kg ha^{-1}) during 2020 (Directorate of Economics and Statistics, 2020) whereas in 2022 it is grown on 1.42 million ha with producing and productivity 1.28 million tons and 1,032 kg ha^{-1}, respectively. In India's vast fallow land, lentils can be cultivated on residual soil moisture after the preceding rice harvest without additional irrigation through relay cropping. In West Bengal, lentil is largely grown on alluvial soil in the districts of Maldah, Murshidabad, Nadia, Dakshin Dinajpur, North 24 Parganas, South 24 Parganas etc.

Proper sowing time adjustment may be an important non-monetary input in lentil production as it is an essential factor that plays a pivotal role in crop growth, nodulation, pod development as well as productivity (Pradhan *et al.,* 2018). The plant environment such as temperature, photo-period, moisture availability (in dryland condition) etc. are significantly differed with the date of sowing. Maneuvering sowing time of the *kharif* crops to successfully accommodate the subsequent cool season crop in the cropping system therefore assures greater significance to increase productivity in rice fallows (Maji *et al.,* 2019). Thus, for ensuring proper sowing time, short or medium duration rice varieties need to be cultivated during *kharif* season because short or medium duration rice will vacate the land by the end October to early November. Switching to such varieties eases the inclusion of CSFLs in the cropping sequence after *kharif* rice by allowing timely sowing.

Apart from sowing time, proper tillage management of the cultivating land is one of the important aspects for ensuring good tilth for germination and subsequent growth of crop, weed control as well as soil and water conservation. In recent years, there is a resurgence of of interest and importance on the shift from extreme tillage to conservation or zero-tillage methods as a low-cost production technology with a substantial effect on minimizing soil and crop residue disturbance, evaporative loss of soil water as well as the energy needs (Erenstein and Laxmi, 2008). Zero tillage practices can have beneficial impacts on productivity as well as minimizing environmental degradation such as soil erosion in legume and cereal crop growing areas (Das *et al.*, 2014). Maturity duration of different varieties can also have significant role in incorporation of pulses in post-rice soil. Under the present climate changing scenario, lentil breeders have done significant efforts during last two decades for development of short-duration varieties with high and stable yield advantages for diverse agro-climatic conditions. An early maturing variety may escape from drought or flooding and allow the cultivation of multiple crops in a year. In West Bengal, lentil varieties like Asha, Ranjan, Subrata, Moitri (duration - 125-130 days) are much popular. But many location specific and high yielding short duration lentil varieties also need to be popularized across lentil cultivating regions of our country. In the backdrop of the afforested facts, this study was designed to access the interactive effects of different sowing conditions, tillage and varieties on growth, nodulation, yield parameters and protein content of lentil grown after monsoon rice under the particular zone.

2. Materials and methods

2.1 Details of experimental site

The experiment was carried out during two successive *rabi* seasons (October to March) of 2019-20 and 2020-21 at the District Seed Farm (22°56' N latitude, 88°32' E longitude and at an altitude of 9.75 m above mean sea level), AB Block, Bidhan Chandra Krishi Viswavidyalaya, Kalyani, Nadia, West Bengal, India. The soil of the experimental field belonged to the class of clayey loam (order: Inceptisol) with medium fertility, almost neutral in reaction (pH 7.0), low in organic carbon (0.52 and 0.57%), available nitrogen (132.59 and 138.19 kg ha^{-1}), phosphorus (24.86 and 29.66 kg ha^{-1}) and potassium (157.82 and 159.16 kg ha^{-1}) for both the years.

2.2 Weather conditions during crop growing period

The day-to-day meteorological data during the period of experiment, collected from AICRP on Agrometeorology, Directorate of Research, Bidhan Chandra Krishi Viswavidyalaya, Kalyani, Nadia, West Bengal. The experimental site falls under sub-tropical humid climate with

32.4°C

short and mild winter. The average annual rainfall of the region is 1460 mm, 85% of which is received during June to September. The maximum and minimum temperatures during the cropping period ranged between 24.5-32.4°C and 10.1–22.5°C in 2019-20 and 23.4–32°C and 11.2–23.3°C in 2020-21. Relative humidity in this cropping season perceived between 96.0–42.5% and 97.5–40.1% during 2019-20 and 2020-21, respectively.

2.3 Experimental design and treatment details

The experiment was laid out in split-split plot design comprising 12 treatment combinations with 3 replications, where main plots comprised of 2 sowing conditions (S_1: early sowing *i.e.*, 1st week of November after harvesting of short duration monsoon rice *i.e.*, Sahabhagi and S_2: delayed sowing *i.e.*, last week of November after harvesting of long duration monsoon rice *i.e.*, Swarna), 3 tillage practices in sub plots (T_1: relay cropping, T_2: zero tillage, T_3: conventional tillage) and two varieties of lentil (V_1: short duration 'L 4717', V_2: long duration 'Moitri') were laid on sub-sub plots. There was a difference of at least 20 days between the early and late sowing period. The experimental field was divided into 72 number of plots in 3 replications having plot size of 4 m × 3 m each.

2.4 Crop management

Proper care had been taken for the management of the crop from land preparation to harvest of the crop. In case of relay cropping, water soaked seeds of lentil were broadcasted @ 60 kg ha^{-1} in the standing rice crop in r well-moist soils 7-10 days before harvest for both date of sowing. Residues of previous rice was left out in the field and zero tillage was done with zero till drill soon after rice harvest in the marked plots for both date of sowing. One deep ploughing with disc plough followed by 2 harrowings and 1planking was provided for conventional tillage treatment. After the final land preparation, the seeds were sown @ 35 kg ha^{-1} at a distance of 30 cm row to row by opening furrows and placing seeds in a depth of 3-4 cm in zero tilled (by a manual hand tyne drilling 65 mm in between two rice stubbles) and conventionally tilled plots for both date of sowing. Recommended fertilizer dose of 20:40:40 kg N-P_2O_5-K_2O ha^{-1} for lentil was applied as basal. Full dose of nitrogen, phosphorous and potassium were applied at the time of sowing crop. No external irrigation was provided during the crop growth as the crop was grown in residual moisture of the post-rice soil. Two hand weedings at 25 and 50 DAS for lentillentil was done to minimize the crop-weed competition. The crop was harvested manually when the leaves become yellow and about 85-90% of green pods turned to golden straw colour. After threshing, cleaning and drying, the seeds of each plot were weighed separately and yield was determined in terms of kg ha^{-1}.

2.5 Methodology used

The growth indices of lentil like plant height at harvest, dry aerial biomass at harvest, number of nodules plant^{-1} at 45 and 60 DAS, dry weight of nodules plant^{-1} at 45 and 60 DAS were determined after collection of five randomly selected plant samples of lentil from experimental plots following standard procedure as described in Mukherjee *et al.* 2023. The yield components and seed yield of lentillentil were determined at maturity. Crude protein content of lentil seed was estimated by multiplying the nitrogen content of the seed with a factor 6.25 (based on the assumption that protein constitutes 16% nitrogen). The data obtained in the study were analyzed using 'Analysis of Variance' technique (ANOVA) following standard statistical procedures (Gomez and Gomez, 1984).

3. Results and discussion

As lentil is an indeterminate crop, growth parameters such as plant height and dry aerial biomass accumulation tend to increase with the advancement of the crop growth and reach a peak at harvest irrespective of different treatments.

Growth indices and nodulation

Plant height

Early sowing of lentil after harvesting of short duration *kharif* rice recorded highest plant height (51.2 cm and 53 cm) compared to delayed sowing of lentil after harvesting of long duration *kharif* rice at harvest (50.5 and 52.3 cm) during both the years of the study (Table 1). This might be due to its congenial weather condition during the first sowing date of lentil which provided favourable environment for the growth and development of the crop. The findings of Mukherjee *et al.* (2023)and Sen *et al.* (2016) in lentil also support the findings of the present investigation regarding plant height of lentil where reduction of plant height was observed with late sowing in the last week of November. Among tillage treatments, highest plant height was noted in zero tillage at harvest (53.6 and 55.4 cm) followed by relay cropping (50.7 and 52.8 cm) during 2019-20 and 2020-21, respectively. Zero tillage perhaps provided an advantage to crop over weeds, resulting in better resource utilization and greater suppression of weeds than the other treatments that indirectly led to better growth of the crop. These results can be supported by the experiments of Quddus *et al.* (2020) and Banjara *et al.* (2017). Among the varieties studied in the study, lentil variety L4717 resulted in the significantly tallest plant at harvest (51.5 and 53.4 cm) compared to the other during both the years. The genetic makeup of the short-duration variety may have resulted in taller plants compared to the longer-duration one.

Dry aerial biomass

Dry aerial biomass accumulation is an important index indicating the photosynthetic efficiency of the crop which ultimately influences the crop yield. Irrespective of different treatment factors, maximum dry aerial biomass accumulation of lentil was recorded at harvesting stage of the crop. The early sowing of lentil resulted in superior dry aerial biomass accumulation (142.82 and 150.49 g m^{-2}) at harvest as compared to delayed sown crop during 2019-20 and 2020-21 respectively. The results of the experiment conducted in chickpea by Tiwari *et al.* (2016) and Neenu *et al.* (2017) regarding dry matter accumulation also was in accordance with the results of present investigation. Among different tillage practices, significantly maximum dry aerial biomass accumulation of lentil at harvest was noted in zero tillage plots (152.20 and 162.15 g m^{-2}) followed by relay cropped plots during both the years of investigation (Table 1). Improved soil moisture and nutrient availability at the crop root zone, sufficient aeration aid in greater transpiration surface area of leaf which mutually could contribute to better results in lentil plots with zero tillage. During both the years of experimentation, lentil short duration variety 'L 4717' attained maximum dry aerial biomass accumulation (143.83 and 151.99 g m^{-2}) at harvest as compared to long duration lentil variety 'Moitri'.

Number of nodules plant

Early November sown lentil noted significantly superior number of root nodules $plant^{-1}$ at 45 DAS (13 and 14.3) and 60 DAS (23.1 and 27.2) compared to last week of November sown lentil for both the years of experimentation. Mukherjee *et al.* (2023) and Visha Kumari *et al.* (2019) also noticed significant influence of earlier sowing date on number of nodules $plant^{-1}$ of lentil which is in close proximity with the result of the present experiment. The number of nodules $plant^{-1}$ also followed similar trend of maximum value in zero tilled plots of lentil at respective growth stages in comparison to other tillage operations during two consecutive seasons at Kalyani, West Bengal (Table 1). The better results in zero tilled plots of lentil in the present experiment may be due to better seedbed preparation which might have helped in better root growth in no tilled plots. These findings could be supported by the previous observations of Quddus *et al.* 2020 in various growth parameters of winter lentils with various tillage operations. Among the different lentil varieties studied, the maximum number of nodules $plant^{"1}$ was found in the short-duration variety 'L 4717' at 45 (13.3 and 14.6) and 60 DAS (24 and 27.9) during both the years. The results of Sikdar *et al.* (2015) and Sen *et al.* (2016) were also in accordance with this among different winter legumes across different locations.

Dry weight of nodules plant

Very slight or negligible differences in dry weight of nodules $plant^{-1}$ were observed among the sowing conditions provided in the experiment. The trend regarding this observation also follows the similar trend like other growth attributing parameters of lentil in the experiment. Regarding dry weight of nodules $plant^{-1}$, soil moisture is supposed to be the reason behind overall lesser gain in dry weight of nodules $plant^{-1}$in delayed sowing condition which was in accordance with the results of Sah *et al.*, 2019. Significantly maximum dry weight of nodules $plant^{-1}$was recorded in zero tillage treated plots of lentil at 45 DAS (13.1 and 16.3 mg) and 60 DAS (19.5 and 22.2 mg) followed by relay cropped plots during 2019-20 and 2020-21, respectively. Lowest dry weight of nodules $plant^{-1}$ was exhibited by conventionally tilled plots in the mentioned growth stages of lentil in the study (Table 1). During both the years of investigation, lentil variety 'L 4717' attained higher dry weight of nodules $plant^{-1}$ at the observed stages as compared to long duration 'Moitri' variety at lower gangetic plains of West Bengal. This is mainly because L 4717 has higher total nitrogen uptake hence had enhanced nodule growth compared to the later long duration variety (Mukherjee *et al.*, 2023).

Yield parameters

Number of pods plant

Early sowing of lentils resulted in more number of pods $plant^{-1}$ (89.6 and 103.7) during two consecutive years at Kalyani, West Bengal due to favourable temperatures during the crop growth period and higher growth attributes, which may be responsible for a better source-sink relationship. Zero tillage treated plots recorded superior number of pods plant^{-1} (106.7 and 117.3) of lentil followed by relay cropping (88.5 and 102.8) and conventional tillage (69.7 and 87.3) in 2019-20 and 2020-21 respectively (Table 2). The higher yield attributes in zero tillage plots in lentil was in accordance with the results of Bandyopadhyay *et al.* (2018) and Quddus *et al.* (2020) across different locations of the country. There were varietal differences in the number of pods plant^{-1} too owing to the genetic potential.

Number of seeds pod

In 2019-20, significant variation was observed between both the sowing dates of lentil regarding number of seeds pod^{-1}. Although earlier sown crop recorded higher number of seeds pod^{-1} (1.4) but it was statistically at par with delayed sown crop (1.3) in 2019-20. Similar trend like other yield attributes was recorded regarding the mentioned parameter among tillage treatments during 2018-19 and 2019-20 with zero tillage treatment recorded highest number of seeds pod^{-1} (1.6 and 2.0) over the others. Non significantly variation was observed among the two lentil varieties in the experiment for other yield parameters for both the years at Kalyani, West Bengal (Table 2).

Test Weight

Based on the statistical analysis of two years, early November sown crop resulted higher test weight (18.75 and 18.93 g) in comparison with late November sown crop that resulted in lesser test weight of 1000 seeds. Data showed that, tillage treatments could be arranged as: zero tillage (19.30 and 19.95 g) > relay cropping (18.70 and 18.65 g) > conventional tillage (18.00 and 17.85 g) regarding this parameter during 2019-20 and 2020-21 respectively (Table 2). The results were in accordance with the report of Saha *et al.* 2020 who showed zero tillage (ZT) produced almost 7% higher seed index over conventional tillage (CT). Similar kind of significant observations were noted regarding test weight among two different duration lentil varieties where short duration 'L4717' variety has resulted significantly higher test weight during two consecutive years of experimentation.

Seed Yield

As outcome of growth and yield characteristics, seed yield also varied significantly among the treatments applied during both the years of investigation. Based on sowing conditions, during 2019-20, lentil yield varied between 1108-1131 kg ha^{-1} and in 2020-21 it was ranged from 1100-1132 kg ha^{-1}. The advantage of early winter sowing over late sowing on the seed yield is because most of the vegetative growth in winter pulses occurs under cool, moisture assured conditions and drought stress is deferred to the later part of reproductive growth. The results regarding seed yield is in conformity with the research findings of Mukherjee *et al.,* (2023) and Sen *et al.,* (2016) also. Data also indicated that, tillage treatments could be arranged as: zero tillage (1271 and 1313 kg ha^{-1}) > relay cropping (1081 and 1061 kg ha^{-1}) > conventional tillage (1006 and 974 kg ha^{-1}) regarding this parameter during 2019-20 and 2020-21, respectively (Table 2). The reasons of more seed yield in zero tillage plots might be due to compound effects of reduced soil erosion, suppressed nutrient removal by weeds, better soil physical health and restoration of soil moisture via reduced soil surface evaporation etc. which were in conformity with Saha *et al.,* (2020) and Neenu *et al.,* (2017). The short duration variety 'L4717' noted superior seed yield as compared to long duration lentil variety 'Moitri' during both the years of study.

Protein content

Protein content is an important quality parameter of lentil seed. The protein content of lentil seed was influenced significantly by different treatment factors in the experiment. Seed protein content (%) varied significantly between 19.45-20.64 % in 1st year and between 21.01-22.51% in 2nd year of study. Early November sown lentil showed superior protein content as compared to late November sown crop during both the years (Table 2). Zero tilled plots (22.77 and 24.86%) noted to have significantly maximum seed protein content (%) in lentil followed by relay cropped plots (20.31 and 22.03%) and conventionally tilled plots (17.06 and 18.39%) during 2019-20 and 2020-21, respectively. Similar trend like seed yield was also observed in protein content differentiation among the varieties tested in the experiment during both the years.

4. Conclusion

Thus, from the above discussed salient findings in lentil cultivation at lower gangetic plains of West Bengal under the changing climatic scenario, it may be concluded that, sowing time, tillage operations and varietal duration difference had marked significant influence on growth indices, nodulation, yield parameters and protein content in lentil during consecutive *rabi* seasons in the study. The combination of early sowing (1st week of November) + zero tillage + short duration lentil variety 'L4717' after harvesting of short duration *kharif* rice may be recommended for the farmers regarding lentil cultivation for this region due to superiority of growth, nodulation, parameters as well as higher yield and protein content.

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Table 1 : Effect of sowing time, tillage and variety on growth parameters and nodulation pattern of lentil grown after monsoon rice

Treatment	Plant height at harvest (cm)		Dry aerial biomass at harvest (g m^{-2})		Number of nodules plant^{-1}				Dry weight of nodules plant^{-1} (mg)			
					45 DAS		60 DAS		45 DAS		60 DAS	
	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21
Sowing time												
S_1, Early sowing	51.2	53.0	142.82	150.49	13.0	14.3	23.1	27.2	11.2	14.3	16.2	18.9
S_2, Delayed sowing	50.5	52.3	141.23	148.70	12.4	13.6	22.5	26.5	10.7	13.7	15.7	18.4
SEm (±)	0.06	0.01	1.05	0.65	0.11	0.06	0.01	0.03	0.01	0.06	0.10	0.04
CD (P = 0.05)	0.38	0.08	NS	NS	NS	0.40	0.04	0.20	0.05	0.36	0.50	0.22
Tillage												
T_1, Relay cropping	50.7	52.8	142.63	150.72	12.8	14.3	22.9	27.3	10.8	13.9	16.3	19.0
T_2, Zero tillage	53.6	55.4	152.20	162.15	15.8	17.0	28.3	31.7	13.1	16.3	19.5	22.2
T_3, Conventional tillage	48.2	49.9	131.26	135.91	9.5	10.6	17.2	21.5	8.9	11.8	12.1	14.7
SEm (±)	0.04	0.07	1.63	2.00	0.05	0.10	0.07	0.08	0.08	0.07	0.06	0.06
CD (P = 0.05)	0.16	0.26	6.35	7.79	0.21	0.40	0.27	0.33	0.32	0.26	0.23	0.25
Varieties												
V_1, 'L 4717'	51.5	53.4	143.83	151.99	13.3	14.6	24.0	27.9	11.5	14.5	16.7	19.4
V_2, 'Moitri'	50.1	51.9	140.23	147.20	12.1	13.3	21.7	25.8	10.4	13.5	15.2	17.8
SEm (±)	0.07	0.07	1.28	0.63	0.04	0.04	0.06	0.05	0.07	0.09	0.09	0.08
CD (P = 0.05)	0.26	0.25	NS	2.33	0.16	0.15	0.22	0.20	0.26	0.33	0.35	0.30

Table 2 : Effect of sowing time, tillage and variety on yield parameters and protein content of lentil grown after monsoon rice

Treatment	Number of pods plant^{-1}		Number of seeds pod^{-1}		Test weight (g)		Seed yield (kg ha^{-1})		Protein content (%)	
	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21
Sowing time										
S_1, Early sowing	89.6	103.7	1.4	1.5	18.75	18.93	1131	1132	20.64	22.51
S_2, Delayed sowing	87.0	101.2	1.3	1.3	18.57	18.70	1108	1100	19.45	21.01
SEm (±)	1.20	5.60	0.06	0.03	0.06	0.04	1.47	0.45	0.13	0.19
CD (P = 0.05)	NS	NS	NS	NS	NS	NS	8.70	2.63	0.77	1.12
Tillage										
T_1, Relay cropping	88.5	102.8	1.4	1.1	18.70	18.65	1081	1061	20.31	22.03
T_2, Zero tillage	106.7	117.3	1.6	2.0	19.30	19.95	1271	1313	22.77	24.86
T_3, Conventional tillage	69.7	87.3	1.1	1.1	18.00	17.85	1006	974	17.06	18.39
SEm (±)	3.74	3.15	0.09	0.13	0.06	0.05	1.38	2.84	0.21	0.13
CD (P = 0.05)	14.60	12.30	0.33	0.50	0.23	0.20	5.39	11.06	0.80	0.49
Varieties										
V_1, 'L 4717'	91.8	105.3	1.5	1.6	18.90	19.05	1154	1145	20.38	22.09
V_2, 'Moitri'	84.9	99.6	1.2	1.2	18.45	18.60	1084	1087	19.72	21.42
SEm (±)	4.01	3.26	0.11	0.08	0.05	0.05	1.73	0.76	0.07	0.07
CD (P = 0.05)	NS	NS	NS	0.30	0.20	0.17	6.35	2.80	0.26	0.27

*NS= Non-Significant