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Research Note

Evaluation and selection of potato hybrid clones (*Solanum tuberosum*) for yield and associated characters

R.P. Kaur
Central Potato Research Station, Post Bag No. 1, Model Town PO, Jalandhar-144 003, Punjab, India
E-mail: kaur.rp@gmail.com

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Abstract
The present study was undertaken to evaluate advanced generation potato clones comprised 183 genotypes obtained from true potato seed, for early bulking towards high yields and associated characters for development of new varieties and selection of promising lines for different traits using augmented design. This approach provides a very efficient means of screening test entries with replicated controls, at early stages of breeding when propagating material is restricted. Based on the analysis H23 was identified to have a significantly larger number of leaves per stem. Number of stems per plant was observed to be significantly high in H14, H172 and H175. Significantly, lesser undersized tubers were observed for lines H98, H167, H28, H54 and H34. The lines H37 and H162 were identified to be significantly superior giving a marketable yield of more than 1.16 kg/ plant. These lines with significantly high yield are considered for release as varieties after conducting replicated evaluation and based on the desirable characters may be suitably considered as parents in succeeding crossing programmes.

Key words
Potato, selection, augmented block design

Potato has emerged as an important crop, in perspective as a future crop for resolving global food security and poverty alleviation in face of the increasing world population. It is the top staple food in the world and the most important non-grain crop for human consumption. The potato's simplicity of cultivation and wide adoption has made it a valuable cash crop for millions of farmers. India is the second largest producer of potato in the world after China. Its area, production and productivity in India have increased over last six decades by 8.5, 29.4 and 3.5 times, respectively. However, with the rapidly increasing population the country faces multiple challenges in near future with regard to potato production and yield. An increase in demand of potato at the rate of 3.2% ACGR (Average Compound Growth Rate) amounting to an estimated, 125 m tonnes is projected in 2050, with the production in recent years approximately 45 m tonne (CPRI, 2015). However, in view of the more or less reducing cultivable land resource in the country, the problem of food security looms at large demanding rigorous efforts in direction of increasing the productivity of the crop. In the present scenario, it becomes pertinent to develop high yielding potato varieties, so as to enable higher productivity per unit area in the country.

In the early stages of a potato breeding program, a plant breeder is faced with the evaluation of performance of large numbers of potato genotypes, with limited seed material, without replicating the trial. The augmented design, proposed by Federer in as early as 1956 and Federer and Raghavrao in 1975 (Federer, 1956, 1961; Federer and Raghavarao, 1975) deals with this type of limitation, which allow the adjustment of the test line (new treatment) means for environmental effects (blocks, lines, or columns) estimated on the basis of repeated check genotypes. Augmented design allows for in depth study of the unreplicated entries using validated comparison with replicated controls for not only yield but also other associated character as desirable. The results of augmented design may be used in several ways as desired for not only evaluation but also for germplasm screening (IPGRI, 2001). It is also being used in conjunction with QTL mapping (Federer and Crossa, 2012). In the present study Augmented design was used to carry out a methodical statistical evaluation and selection of genotypes belonging to third clonal generation of a breeding programme for developing high-bulking early varieties of potato for north-western plains of India and simultaneously for identifying superior breeding lines, which can be directly used or may serve as potential donors for various yield related characters.

The material in the present study comprised of 183 advanced generation clones of the potato along with 3 controls (Kufri Khyati, Kufri Pukhraj and advanced hybrid J.95-227) planted in an augmented design (Federer 1956) (design generated using IASRI design resources server http://www.iasri.res.in/design/Augmented%20Designs/home.htm) for yield and its attributing characters during *Rabi* 2013 at the experimental farm of Central Potato Research Station, Jalandhar, Punjab, India. The mean annual temperature during the period was 15.28º C and the mean annual rainfall was 19.06 mm. The clones and controls were planted in an augmented design comprising 5 blocks of 43 entries each except 5^{th} block comprising of 41 entries, each control was replicated twice in each block. Seed size tubers (15 nos) of each genotype were planted in a plot size of 18 m^2 ridge and furrow with spacing of 60 cm between rows and 20 cm between plants. All standard agronomic practices recommended for the region were followed for the potato crop.

Agronomic characters namely plant height (cm), number of stems/plant, number of leaves/stem, leaf angle (degrees) and tuber characters namely number of tubers per plant, Number of marketable tubers/plant, number of undersized tubers/ plant, Average yield of tubers/ plant, average marketable yield per plant and average undersize yield/ plant. Agronomic characters were recorded at 45 days after planting and tuber characters were recorded at harvest at 90 days after planting (Haulm cutting at 75 days after planting). The recorded data was subjected to statistical analysis to work out variance and contrast analysis of test and control treatments and critical differences for performing treatment comparisons in augmented design using online IP authenticated statistical analysis tool for augmented designs at http://www.iasri.res.in/ sscnars/ (Rathore *et al.,* 2004).

The augmented design is advocated as an important method for identification of promising breeding and superior lines in crop plants. It was used in potato to evaluate and select true seed lines of potato. Because of the ease of use and its ability to investigate environmental variation, the design was suggested for use in early stages of potato breeding programmes. In the present study the coefficient of variation in the test lines depicted a large variation among the clones with more than 15 per cent variation present in number of stems per plant, plant height, number of tubers per plant, number of marketable tubers per plant, yield of tubers per plant and yield of marketable tubers per plant. While more than 40 per cent coefficient of variation was observed in number of undersize tubers per plant and yield of undersize tubers per plant. Leaf angle and number of leaves per stem showed low coefficient of variation (Table 1). The presence of high coefficient of variability are indicative of larger scope of selection negative/ positive for these traits in the clonal population. Whereas more variability is to be generated for characters having low variability either through changes in gene constellation by hybridization or modern biotechnological tools.

The coefficient of determination (R^2) which is equivalent to the square of correlation coefficient revealed high correlation between the unadjusted and adjusted means. This implies the minimum effects of heterogeneity in the experiment.

The contrast analysis (Table 2) among the controls, tests and tests versus control revealed that among that controls significant difference existed only for the number of economically sized tubers, this however did not reflect in the comparison of yields of the controls used, thus implying an overall uniformity among the controls used in the experiment. The effects of the checks have generally been considered fixed in plant breeding as they are generally standard released varieties (Santos *et al.*, 2002). Soil heterogeneity was low and therefore favorable for carrying out a valid selection. Significant differences were observed for Number of leaves/ stem, Number of stems, Number of tubers and marketable yield per plant. Whereas, non significant differences were observed for the other characters leaf angle, Number of marketable tubers , Number of undersized tubers, Plant height, Yield per plant, Yield of marketable tubers/ plant and yield of undersized tubers/ plant.

Significant differences between test lines and control varieties revealed variability in the genotypes and fair scope of short listing better performing lines. The adjusted means of the lines using Tukey's HSD for the traits having significant differences different lines could be identified having favorable characters of interest. The adjusted means, standard errors and Tukey HSD, for making different comparisons between contols and test advanced hybrids have been depicted in table 3.

The leaf angle was observed to show non-significant adjusted means. In potato, leaf angle is important as a prostate leaf (leaf angle closer to 90^0), has more leaf area exposed to sunlight and therefore carries out active photosynthesis. The leaf angle among lines varied between $46^0$to 57^0 showing no significant differences. The number of leaves per stem in the different lines showed significant differences and lines H23 was identified to have a significantly larger number of leaves per stem. This is an important character, as it is directly linked with the photosynthetic area available to the plant. The accession can be useful for incorporating the trait. Some of the lines including control J.95-227, H32, H33, H40, H148, H159 were observed to have significantly less number of leaves per stem.

Number of stems per plant showed significant variation where a significant observation was made that the three controls showed lesser number of stems per plant. Similar significantly lower number of stems per plant were observed in lines H121, H2, H33, H81, H69 and H132. Significantly higher number of stems per plant were observed in H14, H172 and H175. Number of stems per plant has been reported to be both positively (Lemaga and Caesar, 1990; Asghari-Zakaria, Fathi, and Hasan-

Panah, 2006) as well as negatively (Collins, 1977; Almekinders, 1991) correlated to total yield. They are an important criterion reflecting the higher biomass and photosynthetic area available to a plant for fixing atmospheric carbon dioxide into carbohydrates present as a major component of potato tubers. However in the present study significantly lesser number of leaves were observed in controls which are identified high yielding varieties of the region. This is in contradiction to the previous studies, and a more detailed study using correlation and sequential path analysis may be employed to explore the same. Based on the present study there is a clear indication that the partitioning of assimilates is towards the sink *viz*. tubers and not towards the development of the vegetative structures, which may be cause of significantly lesser stems in controls. Therefore, the selection should target plants with not very high but limited vegetative growth. Thereby ensuring optimum utilization of photosynthetic assimilates.

The total number of tubers per plant were counted and significant differences were observed. Lines H21, H81 produced significantly larger number of tubers, whereas H98, control Kufri Khyati and H119 produced significantly lesser number of tubers. The number of tubers is not a very good indicative of economic importance of the line. Rather it becomes imperative to partition the total number of tubers into tubers of marketable importance referred to as marketable size and non-marketable as the undersize tubers. These would then reflect the exact economic importance of the lines with respect to selection.

The number of tubers having average diameter below 3 cm were considered to be non-marketable and not acceptable by the consumers. It therefore becomes an important trait of interest for the breeders. Uniform and large sized tubers are a consumers preference and it reflects genetic architecture of the plant where proper partitioning of the assimilates to the formed tubers occurs. Contrarily, a plant forms several tubers where some of them become oversized and the rest remain undersized and of no economic importance. In the study significant differences were observed for the lines showing significantly larger number of undersize tubers. All the three controls were observed to be having significantly lowest number of undersize tubers. This is one of the most noteworthy observations of the study and makes an indicative towards the physiology and genetic makeup of the plants which provides for the proper portioning of the assimilates, ensuring minimum number of undersized tubers and assuring higher yields. Significantly, lesser undersized tubers were also observed for lines H98, H167, H28, H54 and H34. Whereas lines H73 and H58 were observed to yield larger number of undersize tubers. These lines may be considered for use in development of speciality baby potatoes.

The character marketable yield per plant was observed to show significant differences and is of immense economic importance. It is relevant with respect to consumer preference and ease of processing into food products (Asghari-Zakaria, Fathi, and Hasan-Panah, 2006). Whereas mostly all the lines were at par to the control in regard to this trait Line H37 was observed to be significantly superior giving a yield of approximately 1.167 kg/ plant, followed by line H162 which which gave a yield of 1.163 kg/plant. The lines H22 and H131 were observed to be significantly inferior in regard to the yield of marketable tubers.

In breeding field crops, the ultimate goal is to improve yield as compared to contemporary released varieties, including other important traits of interest like resistance etc. This study analyzed the agro-morphological characters and yield of potato genotypes under irrigated condition. It has been well established that selection for yield per se not be effective as yield is a function of various plant characters and therefore, genes for yield per se may be absent but genes may be present for its components. Evaluation of yield contributing characters using augmented design offers a systematic way of carrying out selection where such positive relationships can be easily worked out.The most significant observations arise that yield may not be correlated to the number of stems but to the proper partitioning of the assimilates, which is based on the observation of significantly lesser number of stems recorded for established control varieties of the region. Also that the uniformity of tuber size or the lesser number of undersize tubers also affect yield per se. The study for evaluation of advanced breeding using augmented design of large number, to identify superior lines for various traits, it may be utilized to carry out effective selection as compared to the visual and yield data based selections, routinely followed in crop improvement programmes worldwide. However, the morphometric traits are also important for assessment of a potato variety in terms of its shape, size, depth of eyes etc. Therefore, augmented design used in conjunction with breeders sense of selection may be useful in making rapid strides in carrying out effective selection, in potato breeding programmes.

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Table 1. Basic statistics for quantitative traits of potato

Label	Minimum	Maximum	Mean	Std Dev.	CV	RMSE	R^2
LA	46.00	57.00	53.03	1.87	3.26	1.73	0.91
NL	10.00	20.33	13.54	1.73	9.25	1.25	0.94
NS	3.00	19.00	7.31	2.39	20.54	1.50	0.96
PH	30.33	97.67	49.05	9.85	17.19	8.43	0.92
NT	5.57	35.00	16.42	4.81	19.88	3.27	0.95
NUT	0.67	20.00	4.93	3.00	43.83	2.16	0.94
NMT	4.86	22.86	11.49	2.74	19.22	2.21	0.93
YT	0.19	1.21	0.67	0.16	18.36	0.12	0.93
YUT	0.00	0.16	0.04	0.02	65.47	0.03	0.86
YMT	0.16	1.17	0.63	0.15	17.73	0.11	0.94

Table 2. Contrast analysis (mean squares) of different sources of test and control

Source	A Mean square	NL mean square	NS Mean Square	PH Mean Square	NT Mean Square	NMT Mean Square	NUT Mean Square	Y Mean Square	YMT Mean Square	YUT Mean Square
blk	4.99	1.87	5.08	152.29	19.81	3.49	10.73	0.00461	0.00553	0.00042
trt	3.12	3.03*	6.19*	92.16	23.93*	7.83	8.68	0.02485	0.02432*	0.00051
Tests	3.17	3.03*	6.14*	91.91	23.71*	7.69	8.69	0.02438	0.02387*	0.00050
Controls	0.63	2.68	2.29	158.64	34.25	19.40*	5.65	0.02276	0.01304	0.00138
Tests vs Controls	0.001	2.78	23.35*	4.18	41.90	9.32	11.70	0.11415*	0.12819*	0.00041
Error	3.00	1.57	2.26	71.12	10.67	4.88	4.67	0.01546	0.01238	0.00075

Leaf angle (LA), Number of leaves/ stem (NL), Number of stems (NS)Plant height (PH), , Number of tubers (NT), Number of marketable tubers (NMT), Number of undersized tubers (NUT), Yield per plant (YT), Yield of marketable tubers/ plant (YMT) and yield of undersized tubers/ plant (YUT)

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Table 3. The adjusted means, standard errors and Tukey HSD for controls and test advanced hybrids

		Block no.	A	NL	NS	NT	NMT	NUT	PH	Y	YMT	YUT
1.	Kufri Khyati	-	53.27	13.10^{AB}	6.13^{CD}	**13.44^{BC}**	9.95	3.49^{D}	50.10	0.687	0.657^{ABC}	0.030
2.	KufriPukhraj	-	52.77	13.83^{AB}	6.30^{CD}	17.15^{ABC}	12.56	4.59^{D}	51.83	0.712	0.679^{ABC}	0.033
3.	J.95-227	-	53.07	**12.83^{B}**	7.03^{BCD}	15.32^{ABC}	10.39	4.93^{D}	44.23	0.779	0.727^{ABC}	0.052
4.	**Control mean**	**-**	**53.04**	**13.25**	**6.49**	**15.30**	**10.97**	**4.34**	**48.72**	**0.726**	**0.687**	**0.038**
5.	H149	1	51.92	15.09^{AB}	4.60^{BCD}	22.39^{ABC}	11.45	10.94^{ABCD}	34.78	0.590	0.487^{ABC}	0.103
6.	H61	1	49.92	13.76^{AB}	5.27^{BCD}	14.22^{ABC}	10.78	3.44^{ABCD}	46.78	0.727	0.682^{ABC}	0.044
7.	H108	1	54.59	14.09^{AB}	5.60^{BCD}	11.27^{ABC}	9.26	2.01^{BDE}	48.78	0.696	0.681^{ABC}	0.015
8.	H106	1	54.92	12.76^{AB}	6.93^{BCD}	10.93^{ABC}	9.49	1.44^{BDE}	50.11	0.598	0.576^{ABC}	0.023
9.	H176	1	50.59	13.76^{AB}	11.27^{ABCD}	12.05^{ABC}	9.49	2.56^{ABCD}	51.44	0.638	0.612^{ABC}	0.027
10.	H27	1	54.59	14.76^{AB}	5.93^{BCD}	9.66^{ABC}	9.00	0.66^{D}	66.78	0.632	0.613^{ABC}	0.019
11.	H182	1	51.92	11.42^{AB}	7.27^{BCD}	14.55^{ABC}	10.83	3.72^{ABCD}	67.44	0.765	0.724^{ABC}	0.041
12.	H124	1	52.26	12.76^{AB}	6.27^{BCD}	20.89^{ABC}	13.56	7.33^{ABCD}	63.11	0.776	0.682^{ABC}	0.093
13.	H114	1	51.92	15.42^{AB}	4.93^{BCD}	9.55^{ABC}	7.11	2.44^{ABCD}	66.44	0.618	0.583^{ABC}	0.036
14.	H17	1	52.92	12.09^{AB}	4.93^{BCD}	14.22^{ABC}	12.45	1.77^{BDE}	52.78	0.727	0.691^{ABC}	0.036
15.	H142	1	53.26	13.42^{AB}	6.60^{BCD}	9.72^{ABC}	8.11	1.61^{BDE}	54.44	0.635	0.602^{ABC}	0.033
16.	H41	1	52.59	15.09^{AB}	6.60^{BCD}	9.55^{ABC}	5.11	4.44^{ABCD}	53.78	0.373	0.311^{ABC}	0.063
17.	H78	1	51.92	14.42^{AB}	7.93^{ABCD}	15.55^{ABC}	11.61	3.94^{ABCD}	54.11	0.588	0.546^{ABC}	0.043
18.	H73	1	53.92	15.09^{AB}	9.60^{ABCD}	27.55^{ABC}	9.11	**18.44^{AC}**	58.78	0.541	0.426^{ABC}	0.116
19.	H179	1	50.59	12.09^{AB}	9.27^{ABCD}	15.80^{ABC}	10.86	4.94^{ABCD}	39.11	0.671	0.606^{ABC}	0.065
20.	H135	1	50.26	12.76^{AB}	9.27^{ABCD}	14.18^{ABC}	9.36	4.81^{ABCD}	37.78	0.511	0.459^{ABC}	0.052
21.	H18	1	53.59	13.76^{AB}	6.93^{BCD}	15.05^{ABC}	10.11	4.94^{ABCD}	51.11	0.650	0.586^{ABC}	0.065
22.	H21	1	54.92	12.76^{AB}	12.27^{ABCD}	**30.55^{AB}**	17.11	13.44^{ABCD}	36.44	1.015	0.880^{ABC}	0.136
23.	H98	1	55.26	15.42^{AB}	4.27^{BCD}	**5.89^{C}**	6.78	**-0.89^{D}**	51.44	0.483	0.472^{ABC}	0.011
24.	H161	1	50.26	13.42^{AB}	6.93^{BCD}	14.22^{ABC}	11.61	2.61^{ABCD}	50.44	0.547	0.507^{ABC}	0.039
25.	H5	1	52.26	13.09^{AB}	6.60^{BCD}	12.00^{ABC}	10.23	1.77^{BDE}	41.11	0.613	0.572^{ABC}	0.041
26.	H6	1	49.92	13.76^{AB}	7.27^{BCD}	12.10^{ABC}	9.11	2.98^{ABCD}	49.11	0.377	0.329^{ABC}	0.048
27.	H164	1	52.92	13.76^{AB}	8.60^{ABCD}	13.05^{ABC}	8.61	4.44^{ABCD}	44.44	0.478	0.415^{ABC}	0.064

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Table 3. Contd.,

		Block no.	A	NL	NS	NT	NMT	NUT	PH	Y	YMT	YUT
28.	H88	1	53.26	13.42^{AB}	7.60^{ABCD}	10.33^{ABC}	9.00	1.33^{BDE}	55.11	0.571	0.543^{ABC}	0.028
29.	H128	1	53.26	14.09^{AB}	9.27^{ABCD}	12.55^{ABC}	10.36	2.19^{ABCD}	50.44	0.566	0.541^{ABC}	0.025
30.	H94	1	53.92	15.42^{AB}	5.93^{BCD}	12.12^{ABC}	8.69	3.44^{ABCD}	50.11	0.596	0.559^{ABC}	0.038
31.	H167	1	50.92	13.76^{AB}	8.27^{ABCD}	9.74^{ABC}	9.11	**0.62^{D}**	53.11	0.523	0.500^{ABC}	0.023
32.	H38	1	50.92	13.42^{AB}	6.27^{BCD}	21.22^{ABC}	11.67	9.55^{ABCD}	38.44	0.650	0.561^{ABC}	0.089
33.	H1	1	53.92	16.76^{AB}	8.27^{ABCD}	18.55^{ABC}	11.11	7.44^{ABCD}	79.44	0.644	0.558^{ABC}	0.087
34.	H122	1	53.59	16.42^{AB}	7.60^{ABCD}	19.22^{ABC}	15.78	3.44^{ABCD}	55.78	0.758	0.717^{ABC}	0.041
35.	H115	1	53.59	13.42^{AB}	7.60^{ABCD}	13.01^{ABC}	10.02	2.98^{ABCD}	44.11	0.641	0.606^{ABC}	0.035
36.	H72	1	54.26	12.09^{AB}	7.27^{BCD}	15.89^{ABC}	12.45	3.44^{ABCD}	50.44	0.843	0.792^{ABC}	0.051
37.	H45	1	49.92	12.09^{AB}	5.93^{BCD}	9.22^{ABC}	7.45	1.77^{BDE}	38.11	0.507	0.471^{ABC}	0.036
38.	H25	1	54.59	14.09^{AB}	14.60^{ABC}	15.89^{ABC}	10.78	5.11^{ABCD}	54.11	0.649	0.565^{ABC}	0.084
39.	H66	1	53.59	12.42^{AB}	6.27^{BCD}	13.27^{ABC}	10.54	2.72^{ABCD}	49.11	0.776	0.723^{ABC}	0.054
40.	H35	1	49.92	12.09^{AB}	11.93^{ABCD}	15.05^{ABC}	12.86	2.19^{ABCD}	42.44	0.667	0.623^{ABC}	0.044
41.	H87	1	52.26	14.09^{AB}	9.60^{ABCD}	11.44^{ABC}	4.67	6.77^{ABCD}	38.44	0.496	0.446^{ABC}	0.050
42.	H50	2	54.48	10.98^{AB}	6.99^{BCD}	19.21^{ABC}	13.01	6.21^{ABCD}	43.89	0.675	0.618^{ABC}	0.057
43.	H60	2	54.14	11.98^{AB}	6.32^{BCD}	11.96^{ABC}	9.69	2.27^{ABCD}	52.56	0.640	0.614^{ABC}	0.025
44.	H15	2	55.48	12.98^{AB}	5.32^{BCD}	17.32^{ABC}	10.01	7.32^{ABCD}	50.56	0.565	0.509^{ABC}	0.056
45.	H47	2	55.14	10.64^{AB}	6.99^{BCD}	17.32^{ABC}	12.78	4.54^{ABCD}	47.56	0.779	0.746^{ABC}	0.033
46.	H28	2	54.48	13.98^{AB}	7.99^{ABCD}	12.92^{ABC}	10.78	**2.14^{CDE}**	64.56	0.526	0.500^{ABC}	0.026
47.	H54	2	49.48	12.31^{AB}	6.99^{BCD}	12.55^{ABC}	10.78	**1.76^{CDE}**	57.89	0.613	0.585^{ABC}	0.028
48.	H145	2	54.48	12.98^{AB}	7.99^{ABCD}	17.02^{ABC}	9.98	7.04^{ABCD}	55.89	0.655	0.575^{ABC}	0.080
49.	H77	2	50.81	12.98^{AB}	8.32^{ABCD}	24.61^{ABC}	16.50	8.11^{ABCD}	55.89	0.663	0.591^{ABC}	0.072
50.	H133	2	51.48	11.98^{AB}	7.99^{ABCD}	18.45^{ABC}	12.66	5.79^{ABCD}	55.89	0.465	0.427^{ABC}	0.038
51.	H36	2	53.48	14.64^{AB}	6.66^{BCD}	19.66^{ABC}	15.12	4.54^{ABCD}	67.56	0.679	0.642^{ABC}	0.037
52.	H22	2	54.81	16.31^{AB}	6.66^{BCD}	21.57^{ABC}	9.53	12.04^{ABCD}	63.22	0.354	**0.267^{BC}**	0.087
53.	H104	2	46.14	15.98^{AB}	5.32^{BCD}	13.22^{ABC}	10.18	3.04^{ABCD}	51.56	0.645	0.613^{ABC}	0.032
54.	H158	2	56.14	15.31^{AB}	6.32^{BCD}	10.77^{ABC}	7.90	2.87^{ABCD}	57.56	0.485	0.450^{ABC}	0.035
55.	H20	2	51.14	12.31^{AB}	9.32^{ABCD}	18.32^{ABC}	12.12	6.21^{ABCD}	47.22	0.724	0.680^{ABC}	0.044

Electronic Journal of Plant Breeding, 8(1): 294-305 (March 2017)
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Table 3. Contd.,

		Block no.	A	NL	NS	NT	NMT	NUT	PH	Y	YMT	YUT
56.	H137	2	54.48	14.31^{AB}	7.32^{BCD}	21.32^{ABC}	14.16	7.16^{ABCD}	61.89	0.741	0.687^{ABC}	0.054
57.	H58	2	54.48	12.31^{AB}	10.99^{ABCD}	31.32^{ABC}	12.78	**18.54^{AB}**	40.22	1.075	0.983^{ABC}	0.092
58.	H10	2	53.81	17.64^{AB}	5.32^{BCD}	20.07^{ABC}	14.28	5.79^{ABCD}	74.22	0.673	0.628^{ABC}	0.044
59.	H171	2	54.48	11.98^{AB}	7.32^{BCD}	11.47^{ABC}	9.07	2.40^{ABCD}	47.89	0.627	0.594^{ABC}	0.033
60.	H12	2	54.81	15.64^{AB}	10.66^{ABCD}	31.57^{ABC}	17.03	14.54^{ABCD}	53.56	0.756	0.640^{ABC}	0.117
61.	H7	2	55.48	14.98^{AB}	6.32^{BCD}	14.75^{ABC}	12.21	2.54^{ABCD}	49.89	0.773	0.737^{ABC}	0.036
62.	H101	2	54.14	13.31^{AB}	5.66^{BCD}	10.70^{ABC}	8.28	2.41^{ABCD}	42.56	0.706	0.657^{ABC}	0.049
63.	H84	2	51.81	15.31^{AB}	5.32^{BCD}	19.52^{ABC}	13.18	6.34^{ABCD}	61.56	0.809	0.769^{ABC}	0.040
64.	H99	2	54.81	15.64^{AB}	5.66^{BCD}	14.21^{ABC}	10.23	3.98^{ABCD}	49.22	0.574	0.540^{ABC}	0.034
65.	H53	2	50.81	11.64^{AB}	9.99^{ABCD}	19.89^{ABC}	14.64	5.25^{ABCD}	42.22	0.763	0.708^{ABC}	0.055
66.	H11	2	55.81	13.31^{AB}	8.32^{ABCD}	19.21^{ABC}	14.12	5.09^{ABCD}	49.56	0.700	0.639^{ABC}	0.061
67.	H75	2	56.14	14.98^{AB}	4.99^{BCD}	14.77^{ABC}	10.78	3.98^{ABCD}	53.22	0.584	0.544^{ABC}	0.041
68.	H71	2	53.48	12.31^{AB}	7.32^{BCD}	14.22^{ABC}	11.68	2.54^{ABCD}	53.56	0.902	0.873^{ABC}	0.029
69.	H65	2	55.14	12.64^{AB}	5.66^{BCD}	14.87^{ABC}	11.24	3.63^{ABCD}	56.22	0.834	0.796^{ABC}	0.038
70.	H170	2	52.14	15.31^{AB}	6.32^{BCD}	14.92^{ABC}	11.38	3.54^{ABCD}	59.22	0.573	0.539^{ABC}	0.034
71.	H37	2	51.14	12.98^{AB}	8.66^{ABCD}	18.66^{ABC}	15.78	2.87^{ABCD}	50.22	1.210	**1.167^{A}**	0.043
72.	H56	2	52.14	14.31^{AB}	5.32^{BCD}	17.82^{ABC}	11.78	6.04^{ABCD}	50.22	0.712	0.655^{ABC}	0.057
73.	H146	2	51.81	12.64^{AB}	6.32^{BCD}	20.66^{ABC}	13.90	6.76^{ABCD}	45.56	0.688	0.618^{ABC}	0.069
74.	H34	2	49.48	11.31^{AB}	4.32^{BCD}	13.02^{ABC}	10.98	**2.04^{CDE}**	41.89	0.738	0.714^{ABC}	0.024
75.	H30	2	51.81	11.64^{AB}	11.66^{ABCD}	16.43^{ABC}	11.34	5.09^{ABCD}	50.22	0.603	0.539^{ABC}	0.064
76.	H174	2	49.48	11.31^{AB}	7.32^{BCD}	22.47^{ABC}	12.93	9.54^{ABCD}	42.56	0.683	0.574^{ABC}	0.109
77.	H19	2	51.14	12.64^{AB}	7.32^{BCD}	16.66^{ABC}	14.12	2.54^{ABCD}	41.22	0.749	0.714^{ABC}	0.035
78.	H29	2	51.48	11.31^{AB}	11.32^{ABCD}	14.70^{ABC}	9.53	5.16^{ABCD}	38.22	0.690	0.628^{ABC}	0.062
79.	H138	3	50.48	14.37^{AB}	3.77^{BCD}	13.29^{ABC}	9.86	3.44^{ABCD}	28.06	0.623	0.590^{ABC}	0.033
80.	H40	3	51.81	**9.70^{B}**	8.10^{ABCD}	16.63^{ABC}	12.36	4.27^{ABCD}	46.72	0.743	0.687^{ABC}	0.055
81.	H127	3	54.14	10.70^{AB}	5.77^{BCD}	25.38^{ABC}	14.23	11.15^{ABCD}	38.39	0.774	0.652^{ABC}	0.122
82.	H121	3	52.81	12.37^{AB}	**2.77^{CD}**	11.90^{ABC}	9.30	2.60^{ABCD}	50.06	0.514	0.492^{ABC}	0.022
83.	H105	3	54.81	12.03^{AB}	6.43^{BCD}	17.46^{ABC}	11.52	5.94^{ABCD}	31.06	0.608	0.553^{ABC}	0.054
84.	H153	3	51.81	12.03^{AB}	5.77^{BCD}	14.33^{ABC}	10.46	3.87^{ABCD}	37.39	0.653	0.624^{ABC}	0.028

Electronic Journal of Plant Breeding, 8(1): 294-305 (March 2017)
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		Block no.	A	NL	NS	NT	NMT	NUT	PH	Y	YMT	YUT
85.	H76	3	51.81	15.03^{AB}	10.10^{ABCD}	11.79^{ABC}	8.74	3.05^{ABCD}	57.72	0.424	0.402^{ABC}	0.022
86.	H139	3	54.14	12.70^{AB}	5.10^{BCD}	24.13^{ABC}	13.74	10.38^{ABCD}	35.72	0.683	0.607^{ABC}	0.077
87.	H120	3	53.81	15.37^{AB}	6.10^{BCD}	16.63^{ABC}	10.69	5.94^{ABCD}	55.06	0.509	0.468^{ABC}	0.041
88.	H181	3	50.48	11.03^{AB}	6.10^{BCD}	21.41^{ABC}	17.00	4.41^{ABCD}	31.06	0.609	0.578^{ABC}	0.032
89.	H123	3	52.14	13.37^{AB}	7.10^{BCD}	13.57^{ABC}	10.97	2.60^{ABCD}	44.06	0.562	0.547^{ABC}	0.015
90.	H2	3	54.14	12.37^{AB}	**2.77^{CD}**	14.38^{ABC}	12.36	2.02^{ABCD}	38.06	0.667	0.651^{ABC}	0.016
91.	H126	3	54.14	15.70^{AB}	5.43^{BCD}	11.75^{ABC}	8.61	3.15^{ABCD}	50.06	0.530	0.513^{ABC}	0.017
92.	H178	3	54.48	14.70^{AB}	6.10^{BCD}	12.50^{ABC}	11.11	1.40^{ABCD}	39.06	0.882	0.871^{ABC}	0.011
93.	H33	3	52.14	**9.37^{B}**	**2.77^{CD}**	16.24^{ABC}	11.86	4.38^{ABCD}	46.39	0.554	0.526^{ABC}	0.029
94.	H112	3	52.14	15.70^{AB}	5.10^{BCD}	14.55^{ABC}	12.71	1.84^{ABCD}	47.39	0.998	0.983^{ABC}	0.015
95.	H67	3	52.14	12.37^{AB}	5.10^{BCD}	17.88^{ABC}	12.36	5.52^{ABCD}	42.06	0.623	0.590^{ABC}	0.033
96.	H162	3	53.48	16.03^{AB}	8.10^{ABCD}	17.13^{ABC}	14.86	2.27^{ABCD}	44.72	1.197	**1.163^{AB}**	0.033
97.	H151	3	53.14	13.37^{AB}	5.10^{BCD}	17.57^{ABC}	13.19	4.38^{ABCD}	39.39	0.869	0.840^{ABC}	0.029
98.	H16	3	54.14	11.37^{AB}	14.10	17.63^{ABC}	12.36	5.27^{ABCD}	36.72	0.610	0.582^{ABC}	0.027
99.	H32	3	53.81	**9.37^{B}**	6.43^{BCD}	11.79^{ABC}	9.86	1.94^{ABCD}	46.39	0.505	0.477^{ABC}	0.028
100.	H13	3	53.81	12.37^{AB}	5.43^{BCD}	11.24^{ABC}	9.30	1.94^{ABCD}	38.72	0.588	0.576^{ABC}	0.012
101.	H89	3	52.48	14.03^{AB}	5.10^{BCD}	27.13^{ABC}	19.86	7.27^{ABCD}	38.06	1.117	1.069^{ABC}	0.047
102.	H51	3	51.81	11.37^{AB}	7.10^{BCD}	22.25^{ABC}	14.86	7.40^{ABCD}	36.06	0.839	0.776^{ABC}	0.063
103.	H119	3	52.48	16.37^{AB}	4.43^{BCD}	**9.13^{BC}**	6.86	2.27^{ABCD}	48.72	0.593	0.573^{ABC}	0.019
104.	H154	3	55.14	12.70^{AB}	3.43^{BCD}	12.13^{ABC}	9.95	2.18^{ABCD}	48.72	0.665	0.650^{ABC}	0.015
105.	H159	3	52.14	**10.03^{B}**	9.43^{ABCD}	24.13^{ABC}	13.74	10.38^{ABCD}	42.06	0.518	0.433^{ABC}	0.084
106.	H118	3	54.14	10.37^{AB}	7.10^{BCD}	19.13^{ABC}	15.41	3.72^{ABCD}	38.72	0.719	0.691^{ABC}	0.028
107.	H74	3	54.48	17.37^{AB}	5.77^{BCD}	11.29^{ABC}	8.19	3.10^{ABCD}	77.39	0.540	0.517^{ABC}	0.023
108.	H150	3	53.14	14.03^{AB}	5.10^{BCD}	13.50^{ABC}	11.73	1.77^{ABCD}	42.39	1.035	1.015^{ABC}	0.021
109.	H44	3	54.48	11.37^{AB}	10.77^{ABCD}	14.96^{ABC}	12.36	2.60^{ABCD}	28.06	0.623	0.607^{ABC}	0.017
110.	H130	3	52.14	12.70^{AB}	5.43^{BCD}	16.13^{ABC}	9.86	6.27^{ABCD}	38.06	0.483	0.439^{ABC}	0.043
111.	H148	3	52.81	**10.03^{B}**	9.10^{ABCD}	24.68^{ABC}	16.52	8.16^{ABCD}	36.39	0.880	0.826^{ABC}	0.054
112.	H86	3	53.81	12.37^{AB}	4.77^{BCD}	14.13^{ABC}	10.31	3.82^{ABCD}	34.72	0.652	0.614^{ABC}	0.038
113.	H81	3	52.14	14.03^{AB}	**1.43^{D}**	**34.13^{A}**	19.86	14.27^{ABCD}	35.72	0.742	0.693^{ABC}	0.048
114.	H83	3	52.48	12.03^{AB}	8.77^{ABCD}	26.38^{ABC}	18.36	8.02^{ABCD}	26.06	0.922	0.851^{ABC}	0.071

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		Block no.	A	NL	NS	NT	NMT	NUT	PH	Y	YMT	YUT
115.	H169	3	52.48	12.03^{AB}	7.43^{ABCD}	9.96^{ABC}	6.52	3.44^{ABCD}	35.72	0.463	0.438^{ABC}	0.025
116.	H155	4	51.92	16.20^{AB}	7.32^{BCD}	16.98^{ABC}	10.68	6.29^{ABCD}	39.39	0.988	0.908^{ABC}	0.080
117.	H140	4	48.59	16.87^{AB}	7.99^{BCD}	16.53^{ABC}	10.46	6.07^{ABCD}	39.39	0.500	0.436^{ABC}	0.064
118.	H8	4	49.92	14.20^{AB}	6.32^{BCD}	14.70^{ABC}	11.13	3.57^{ABCD}	62.72	0.766	0.719^{ABC}	0.047
119.	H110	4	50.92	14.20^{AB}	6.32^{BCD}	14.13^{ABC}	9.46	4.67^{ABCD}	62.06	0.630	0.614^{ABC}	0.016
120.	H117	4	54.59	15.20^{AB}	6.66^{BCD}	14.70^{ABC}	10.29	4.41^{ABCD}	59.06	0.560	0.530^{ABC}	0.030
121.	H59	4	52.59	12.87^{AB}	6.32^{BCD}	16.70^{ABC}	12.13	4.57^{ABCD}	41.06	0.821	0.774^{ABC}	0.047
122.	H111	4	53.26	14.87^{AB}	10.66^{ABCD}	14.53^{ABC}	10.46	4.07^{ABCD}	52.06	0.703	0.658^{ABC}	0.045
123.	H107	4	46.92	17.87^{AB}	4.66^{BCD}	16.16^{ABC}	9.46	6.70^{ABCD}	56.72	0.603	0.545^{ABC}	0.059
124.	H55	4	50.92	13.53^{AB}	9.99^{ABCD}	20.53^{ABC}	13.46	7.07^{ABCD}	38.72	0.498	0.456^{ABC}	0.042
125.	H3	4	51.59	15.20^{AB}	7.99^{BCD}	31.96^{ABC}	22.32	9.64^{ABCD}	64.72	0.941	0.850^{ABC}	0.091
126.	H31	4	55.26	12.53^{AB}	6.66^{BCD}	11.42^{ABC}	7.79	3.63^{ABCD}	54.39	0.522	0.486^{ABC}	0.036
127.	H157	4	54.92	16.20^{AB}	6.32^{BCD}	12.82^{ABC}	10.18	2.64^{ABCD}	56.39	0.765	0.732^{ABC}	0.034
128.	H9	4	50.26	14.20^{AB}	7.99^{BCD}	12.83^{ABC}	9.96	2.87^{ABCD}	58.72	0.612	0.581^{ABC}	0.031
129.	H23	4	48.59	$\mathbf{20.53^{A}}$	7.99^{BCD}	16.25^{ABC}	10.89	5.36^{ABCD}	95.39	0.624	0.577^{ABC}	0.046
130.	H24	4	50.26	13.87^{AB}	8.99^{ABCD}	16.76^{ABC}	10.57	6.18^{ABCD}	63.06	0.567	0.520^{ABC}	0.047
131.	H113	4	52.59	12.20^{AB}	4.66^{BCD}	14.03^{ABC}	9.46	4.57^{ABCD}	38.72	0.570	0.530^{ABC}	0.040
132.	H63	4	50.26	11.87^{AB}	6.99^{BCD}	18.66^{ABC}	11.96	6.70^{ABCD}	38.72	0.583	0.523^{ABC}	0.060
133.	H109	4	54.59	15.53^{AB}	3.99^{BCD}	10.82^{ABC}	8.03	2.79^{ABCD}	47.39	0.608	0.555	0.054
134.	H136	4	53.26	11.53^{AB}	11.32^{ABCD}	16.53^{ABC}	10.96	5.57^{ABCD}	57.72	0.672	0.628	0.044
135.	H52	4	52.59	13.87^{AB}	7.99^{BCD}	15.17^{ABC}	10.82	4.35^{ABCD}	52.72	0.686	0.648	0.038
136.	H42	4	50.26	11.87^{AB}	6.99^{BCD}	12.87^{ABC}	9.46	3.41^{ABCD}	42.72	0.531	0.498^{ABC}	0.034
137.	H14	4	50.59	11.87^{AB}	$\mathbf{19.66^{A}}$	17.81^{ABC}	10.37	7.44^{ABCD}	44.06	0.467	0.410^{ABC}	0.057
138.	H173	4	52.92	13.87^{AB}	7.66^{BCD}	26.25^{ABC}	15.89	10.36^{ABCD}	46.06	0.740	0.652^{ABC}	0.088
139.	H49	4	52.26	12.53^{AB}	5.99^{BCD}	13.53^{ABC}	10.37	3.16^{ABCD}	47.06	0.521	0.489^{ABC}	0.032
140.	H97	4	53.59	15.87^{AB}	10.32^{ABCD}	18.45^{ABC}	11.96	6.49^{ABCD}	57.06	0.662	0.582^{ABC}	0.080
141.	H91	4	51.26	14.87^{AB}	5.99^{BCD}	18.53^{ABC}	12.46	6.07^{ABCD}	54.06	0.711	0.670^{ABC}	0.041
142.	H95	4	54.59	16.20^{AB}	8.66^{ABCD}	16.44^{ABC}	9.46	6.98^{ABCD}	55.06	0.481	0.409^{ABC}	0.073
143.	H147	4	51.59	15.53^{AB}	5.99^{BCD}	18.72^{ABC}	12.19	6.53^{ABCD}	46.39	0.577	0.526^{ABC}	0.051
144.	H96	4	53.59	13.53^{AB}	7.99^{BCD}	20.53^{ABC}	15.09	5.45^{ABCD}	41.72	0.766	0.707^{ABC}	0.059

Table 3. Contd.,

		Block no.	A	NL	NS	NT	NMT	NUT	PH	Y	YMT	YUT
145.	H152	4	52.59	17.53^{AB}	4.99^{BCD}	18.87^{ABC}	12.79	6.07^{ABCD}	60.39	1.090	1.036^{ABC}	0.054
146.	H163	4	53.59	14.20^{AB}	11.32^{ABCD}	19.17^{ABC}	12.19	6.98^{ABCD}	47.72	0.579	0.523^{ABC}	0.055
147.	H144	4	52.92	14.20^{AB}	6.99^{BCD}	14.98^{ABC}	11.68	3.29^{ABCD}	52.06	0.760	0.732^{ABC}	0.028
148.	H165	4	54.26	14.87^{AB}	11.32^{ABCD}	14.53^{ABC}	9.46	5.07^{ABCD}	41.39	0.438	0.384^{ABC}	0.054
149.	H166	4	51.26	14.53^{AB}	8.66^{ABCD}	20.53^{ABC}	12.79	7.74^{ABCD}	40.72	0.433	0.362^{ABC}	0.071
150.	H80	4	53.59	14.87^{AB}	9.32^{ABCD}	17.03^{ABC}	8.46	8.57^{ABCD}	45.06	0.527	0.453^{ABC}	0.074
151.	H82	4	53.92	15.20^{AB}	9.99^{ABCD}	14.91^{ABC}	11.34	3.57^{ABCD}	43.72	0.681	0.646^{ABC}	0.035
152.	H160	4	53.59	13.87^{AB}	9.99^{ABCD}	12.53^{ABC}	7.46	5.07^{ABCD}	34.39	0.460	0.400^{ABC}	0.060
153.	H129	5	56.53	15.37^{AB}	6.32^{BCD}	20.75^{ABC}	15.07	5.68^{ABCD}	50.56	0.744	0.718^{ABC}	0.027
154.	H134	5	52.20	14.03^{AB}	5.99^{BCD}	25.46^{ABC}	19.53	5.93^{ABCD}	51.89	0.638	0.610^{ABC}	0.027
155.	H141	5	54.87	12.37^{AB}	8.66^{ABCD}	20.65^{ABC}	14.42	6.22^{ABCD}	55.22	0.602	0.576^{ABC}	0.026
156.	H131	5	52.53	15.03^{AB}	6.32^{BCD}	13.46^{ABC}	7.45	6.01^{ABCD}	60.56	0.232	**0.208^{C}**	0.026
157.	H69	5	54.20	11.70^{AB}	**3.99^{CD}**	13.02^{ABC}	9.67	3.35^{ABCD}	44.22	0.822	0.811^{ABC}	0.010
158.	H183	5	53.87	11.37^{AB}	8.32^{ABCD}	18.37^{ABC}	11.69	6.68^{ABCD}	38.56	0.573	0.547^{ABC}	0.026
159.	H62	5	54.20	12.70^{AB}	13.32^{ABCD}	17.01^{ABC}	11.69	5.32^{ABCD}	43.56	0.602	0.578^{ABC}	0.024
160.	H180	5	55.20	14.37^{AB}	4.99^{BCD}	16.24^{ABC}	11.34	4.90^{ABCD}	54.56	0.839	0.817^{ABC}	0.023
161.	H93	5	53.20	11.70^{AB}	6.99^{BCD}	12.46^{ABC}	9.25	3.22^{ABCD}	42.22	0.448	0.447^{ABC}	0.001
162.	H168	5	54.53	15.03^{AB}	9.66^{ABCD}	17.96^{ABC}	13.28	4.68^{ABCD}	32.22	0.512	0.500^{ABC}	0.011
163.	H177	5	54.20	13.70^{AB}	6.66^{BCD}	10.09^{ABC}	7.66	2.43^{ABCD}	55.22	0.828	0.817^{ABC}	0.011
164.	H125	5	56.53	12.70^{AB}	6.66^{BCD}	20.24^{ABC}	14.67	5.57^{ABCD}	48.56	0.618	0.592^{ABC}	0.026
165.	H92	5	50.87	18.03^{AB}	6.99^{BCD}	8.04^{ABC}	5.64	2.39^{ABCD}	59.56	0.392	0.382^{ABC}	0.009
166.	H64	5	56.53	12.70^{AB}	7.66^{ABCD}	13.46^{ABC}	9.67	3.79^{ABCD}	52.89	0.720	0.713^{ABC}	0.007
167.	H172	5	55.53	14.37^{AB}	**14.32^{ABC}**	10.28^{ABC}	7.69	2.59^{ABCD}	51.89	0.425	0.393^{ABC}	0.032
168.	H4	5	56.87	12.70^{AB}	8.32^{ABCD}	21.24^{ABC}	15.23	6.01^{ABCD}	59.56	0.726	0.698^{ABC}	0.028
169.	H68	5	53.53	13.03^{AB}	6.99^{BCD}	9.61^{ABC}	6.50	3.11^{ABCD}	56.22	0.439	0.425^{ABC}	0.014
170.	H48	5	54.87	11.03^{AB}	7.32^{BCD}	20.80^{ABC}	13.01	7.79^{ABCD}	44.56	0.710	0.666^{ABC}	0.045
171.	H156	5	52.20	15.03^{AB}	4.66^{BCD}	12.83^{ABC}	10.33	2.50^{ABCD}	54.89	0.535	0.532^{ABC}	0.003
172.	H175	5	57.53	12.37^{AB}	**15.66^{AB}**	26.84^{ABC}	16.41	10.4^{ABCD}	50.56	0.897	0.858^{ABC}	0.039
173.	H85	5	55.53	14.03^{AB}	13.66^{ABCD}	16.56^{ABC}	12.38	4.18^{ABCD}	60.56	0.641	0.622^{ABC}	0.019
174.	H70	5	54.87	12.70^{AB}	8.99^{ABCD}	15.86^{ABC}	11.58	4.28^{ABCD}	63.56	0.661	0.650^{ABC}	0.011

Table 3. Contd.,

		Block no.	A	NL	NS	NT	NMT	NUT	PH	Y	YMT	YUT
175.	H100	5	53.53	14.70^{AB}	6.32^{BCD}	14.13^{ABC}	10.23	3.90^{ABCD}	49.89	0.682	0.676^{ABC}	0.006
176.	H116	5	53.87	11.37^{AB}	7.32^{BCD}	20.96^{ABC}	13.28	7.68^{ABCD}	35.22	0.663	0.588^{ABC}	0.075
177.	H46	5	52.53	11.03^{AB}	6.99^{BCD}	13.96^{ABC}	10.78	3.18^{ABCD}	40.89	0.510	0.506^{ABC}	0.004
178.	H57	5	53.87	12.03^{AB}	9.66^{ABCD}	24.18^{ABC}	17.93	6.25^{ABCD}	48.56	1.050	1.024^{ABC}	0.027
179.	H90	5	56.53	14.03^{AB}	8.32^{ABCD}	16.10^{ABC}	11.69	4.41^{ABCD}	44.22	0.687	0.683^{ABC}	0.004
180.	H102	5	56.53	13.37^{AB}	6.66^{BCD}	18.34^{ABC}	15.16	3.18^{ABCD}	35.22	0.864	0.838^{ABC}	0.026
181.	H143	5	53.87	13.37^{AB}	11.99^{ABCD}	20.46^{ABC}	12.78	7.68^{ABCD}	66.22	0.573	0.525^{ABC}	0.048
182.	H39	5	54.87	12.03^{AB}	7.66^{ABCD}	21.96^{ABC}	13.78	8.18^{ABCD}	61.56	0.634	0.596^{ABC}	0.038
183.	H26	5	52.53	14.03^{AB}	6.99^{BCD}	19.61^{ABC}	13.64	5.96^{ABCD}	65.56	0.839	0.812^{ABC}	0.027
184.	H43	5	54.20	12.03^{AB}	6.32^{BCD}	14.04^{ABC}	11.50	2.54^{ABCD}	51.56	0.773	0.769^{ABC}	0.004
185.	H103	5	54.87	17.03^{AB}	5.99^{BCD}	16.84^{ABC}	13.28	3.55^{ABCD}	57.56	0.729	0.719^{ABC}	0.010
186.	H132	5	55.20	14.70^{AB}	**3.66^{CD}**	18.71^{ABC}	13.28	5.43^{ABCD}	51.89	0.640	0.614^{ABC}	0.026
187.	H79	5	52.20	16.03^{AB}	13.66^{ABCD}	26.63^{ABC}	17.45	9.18^{ABCD}	43.56	0.532	0.490^{ABC}	0.042
Between check means S.E. of difference **Tukey's HSD at 5%**			1.09583	0.79317 **5.989**	0.95036 **7.1759**	2.06576 **15.5981**	1.39658	1.36673 **10.3198**	5.3338	0.07863	0.07036 **0.53128**	0.01735
Between adjusted variable in same block S.E. of difference **Tukey's HSD at 5%**			2.45034	1.77358 **13.3918**	2.12507 **16.0459**	4.61919 **34.8783**	3.12285	3.0561 **23.0758**	11.9267	0.17582	0.15733 **1.18798**	0.038796
Between adjusted variables in different blocks S.E. of difference **Tukey's HSD at 5%**			2.82941	2.04795 **15.4635**	2.45382 **18.5282**	5.33378 **40.274**	3.6596	3.52888 **26.6456**	13.7717	0.20302	0.18167 **1.37176**	0.044798
Between adjusted variety against check mean S.E. of difference **Tukey's HSD at 5%**			2.09835	1.5188 **11.4681**	1.81981 **13.7409**	3.95564 **29.868**	2.67425	2.61708 **19.7609**	10.2134	0.15056	0.13473 **1.01732**	0.033223

Leaf angle (LA), Number of leaves/ stem (NL), Number of stems (NS)Plant height (PH), , Number of tubers (NT), Number of marketable tubers (NMT), Number of undersized tubers (NUT), Yield per plant (YT), Yield of marketable tubers/ plant (YMT) and yield of undersized tubers/ plant (YUT)