

PHYSIO-BIOCHEMICAL STUDIES ON THIRTY GENOTYPES OF POTATO (*Solanum tuberosum* L.)

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ABSTRACT: Significant mean squares during two years were observed for leaf area, dry matter content, total chlorophyll content and protein content in tuber exhibiting differential performance of genotypes over different environments. Mean performance of genotypes pooled over two years indicated superiority of Kufri Chipsona-1, J/93-139, Kufri Chipsona-2, J/95-229, J/96-17 and Kufri Anand for tuber yield (480.38, 461.50, 437.38, 431.88, 428.13 and 423.88 q/ha, respectively). Number of tubers per hill was highest in Kufri Pushkar (8.84), JW-160 (8.54) and Kufri Chipsona-1 (8.38). Genotypes exhibiting high values of number of stolon per hill were Kufri Chipsona-1 (19.39), J/95-158 (17.94) and J/96-80 (17.79). Genotypes J/95-80 (90.84g) and J/96-171 (90.67g) exhibited better tuber weight. Genotype PS/96-14 had maximum number of leaves per shoot (18.94) whereas, maximum leaf area occurred in J/96-171 (181.09 cm²). Dry matter content was maximum in Kufri Chipsona-2 (23.55%) followed by Kufri Chipsona-1 (23.22%). Ascorbic acid was found highest in Kufri Bahar (27.18 mg/100g fresh wt.) followed by Kufri Jyoti (26.48 mg/100g fresh wt.). Protein content was maximum in J/95-144 (1.91%) and Kufri Jawahar (1.86%). TSS content was highest in J/93-139 and Kufri Pukhraj (1.59 followed by Kufri Chipsona 2 (1.57 mg) and J/95-221, J-95-80 and J/96-80 (1.56 mg each) J/92-159 (7.39 °B) followed by Kufri Chipsona-1 (7.27 °B) and J/95-242 (7.25 °B). Total chlorophyll content was highest in J/95-80 and Kufri Pukhraj (1.59 mg/g fresh wt.).

Keywords: Potato, genotypes, genetic divergence, phenotypic stability.

The germplasm collection constitutes a reservoir of genes and gene complex and is the raw materials for improvement of crop plants. Diverse genetic materials are, therefore required to meet the ever-changing demands of plant improvement. Genetic divergence is assessed on the basis of field performance of genotypes. Information on genetic diversity in available germplasm collection is, therefore, of paramount importance. To introduce new valuable genes from wild or primitive *Solanum spp.* and to exploit genetic variation efficiency in existing cultivars, a parental line breeding programme with suitable modifications is required. Therefore, considering the above facts the present investigation was carried out.

MATERIALS AND METHODS

The present investigation was conducted at experimental field of Department of Horticulture, C.S.S.S. (P.G.) College, Machhra (Meerut), during *rabi* season of 2007-08 and 2008-09. The experimental material for the present investigation comprised of 30 potato genotypes (Table 1) forming the part of

germplasm procured from CPRI, Shimla. The experiment was laid out in a Randomized Block Design with three replications. Nutrient analysis of soil of experimental field was performed as per Jackson (5). All the observations were recorded on individual plant basis and averaged. Five plants per plot were selected randomly for each genotype. Observations on number of haulms/hill, number of leaves/haulm, leaf area (cm²) by Leaf Area Meter, weight of tuber (g), tuber yield (q/ha), specific gravity of tubers (g/cm³) and tuber dry matter content (%), total soluble solids (°Brix), chlorophyll content (mg/g fresh wt.), number of stolon/hill, number of tubers/hill, ascorbic acid (mg/100g fresh weight) and protein content (%) were recorded. Specific gravity and dry matter content of tubers was calculated as per formula given by Birhman *et al.* (1). Total soluble solids (TSS) of the juice of five tubers of each genotype was determined with the help of 'Hand Refractometer' (Erma, Japan) and the results were expressed as per cent TSS at room temperature (20°C). Chlorophyll content in leaves was estimated at 75 DAP in each genotype. The leaf sample were taken

Table 1: List of potato (*Solanum tuberosum* L.) genotypes tested.

Genotypes					
1. J/95-144	9. J/95-227	17. Kufri Anand	25. Kufri Sutlej		
2. J/95-378	10. J/95-229	18. Kufri Ashoka	26. Kufri Pushkar		
3. J/92-159	11. J/95-242	19. Kufri Bahar	27. MS/99-1871		
4. J/96-84	12. J/93-139	20. Kufri Chipsona-1	28. J/95-226		
5. J/96-149	13. J/95-80	21. Kufri Chipsona-2	29. J/95-158		
6. J/96-171	14. J/95-228	22. Kufri Jawahar	30. J/96-80		
7. J/96-238	15. JW-160	23. Kufri Jyoti			
8. J/95-221	16. PS/96-14	24. Kufri Pukhraj			

from middle portion of five plants in each plot and carried to lab and chlorophyll was estimated by the method of Bruinsama (2). Ascorbic acid of the tuber was estimated by reduction of 2,6-dichlorophenol-indophenol (dye) protein content and

estimated by Micro-Kjeldal method as described by (Ranganna, 6). Statistical analysis of individual as well as pooled data for two seasons was carried out on computer using the software of OPSTAT.

Table 2: Performance of potato genotypes for number of haulms and number of stolon per hill.

Genotypes	No. of stolon /hill			No. of haulms /hill		
	2007-08	2008-09	Pooled	2007-08	2008-09	Pooled
J/95-144	17.67	17.27	17.47	6.27	5.63	5.95
J/95-378	14.93	13.33	14.13	4.87	3.30	4.09
J/92-159	16.87	14.40	15.63	3.67	4.10	3.89
J/96-84	12.00	14.77	13.38	4.00	4.13	4.07
J/96-149	14.47	14.20	14.33	4.00	4.53	4.37
J/96-171	14.50	14.63	14.57	4.83	4.70	4.77
J/96-238	15.53	17.27	16.40	5.87	5.07	5.47
J/95-221	17.83	16.17	17.00	4.60	4.87	4.74
J/95-227	13.17	15.00	14.08	4.50	5.23	4.87
J/95-229	14.6	15.03	14.82	3.20	3.75	3.48
J/95-242	16.87	15.57	16.22	3.80	4.77	4.29
J/93-139	17.37	14.37	15.87	3.78	4.17	3.98
J/95-80	16.00	15.27	15.63	4.67	4.24	4.46
J/95-228	18.50	17.03	17.77	5.80	5.04	5.42
JW-160	18.10	16.47	17.28	6.00	5.33	5.67
PS/96-14	6.23	6.87	6.50	2.00	2.41	2.31
Kufri Anand	13.00	14.27	13.13	4.67	4.15	4.41
Kufri Ashoka	13.90	12.63	13.27	5.20	4.67	4.94
Kufri Bahar	12.97	13.37	13.17	4.20	3.70	3.95
Kufri Chipsona-1	20.37	18.40	19.38	4.70	4.33	4.52
Kufri Chipsona-2	14.50	16.40	15.45	6.13	5.40	5.77
Kufri Jawahar	18.00	17.47	17.73	5.10	4.80	4.95
Kufri Jyoti	15.90	15.50	15.70	5.00	4.23	4.62
Kufri Pukhraj	12.23	14.70	13.47	4.60	4.50	4.55
Kufri Sutlej	14.23	13.13	13.68	5.37	4.63	5.00
Kufri Pushkar	20.37	18.40	19.38	4.70	4.33	4.52
MS/99-1871	16.00	15.27	15.63	4.67	4.24	4.46
J/95-226	14.6	15.03	14.82	3.20	3.75	3.48
J/95-158	18.50	17.03	17.77	5.80	5.04	5.42
J/96-80	17.83	16.17	17.00	4.60	4.87	4.74
General mean	15.19	15.57	15.18	15.36	4.46	4.57
CD (P = 0.05)	5.681	5.698	3.464	3.284	1.17	0.820

RESULTS AND DISCUSSION

Number of haulms and stolons per hill

The performance over two years (Table 2) revealed that the highest number of haulms per hill was found in J/95-144 (5.95) being at par with Kufri Chipsona-2, JW-160, J/95-158, J/95-228, and Kufri Sutlej significantly superior over others. In total, fourteen genotypes surpassed the population mean (4.57). Genotype PS/96-14 (2.21) exhibited the minimum number of haulms per hill. The genotype exhibiting higher value of number of stolons in pooled analysis was Kufri Chipsona-1 and Kufri Pushkar (19.38 each) followed by J/95-158 (17.77) and Kufri

Jawahar (17.73). While PS/96-14 recorded least number of stolons (6.50) which was significantly lower than others. The mean value of population for these traits was 15.18.

Number of leaves per haulm and leaf area (cm²)

Pooled analysis over two years revealed the superiority of PS/96-14 (18.94) for number of leaves per haulm (Table 3) followed by J/95-229 (18.40). The minimum leaves were recorded in J/95-221 and J/96-80 (12.34 each) followed by Kufri Ashoka and J/95-221 (12.97 each). Population mean was 14.40 and eleven genotypes succeeded it. Pooled analysis

Table 3: Performance of potato genotypes for number of leaves per haulm and leaf area.

Genotypes	No. of leaves /haulm			Leaf area (cm ²)		
	2007-08	2008-09	Pooled	2007-08	2008-09	Pooled
1. J/95-144	12.87	13.07	12.97	99.43	101.08	100.26
2. J/95-378	13.87	13.47	13.67	107.17	118.35	112.76
3. J/92-159	14.80	14.00	14.40	184.11	158.23	171.17
4. J/96-84	14.87	14.80	14.84	125.18	125.60	125.39
5. J/96-149	16.67	14.93	15.80	140.30	141.98	141.14
6. J/96-171	15.93	13.07	14.50	195.34	166.84	181.09
7. J/96-238	11.60	14.40	13.00	99.75	102.18	100.97
8. J/95-221	11.67	13.00	12.34	141.13	146.82	143.98
9. J/95-227	13.16	15.20	14.18	86.89	98.89	92.89
10. J/95-229	16.27	20.53	18.40	114.61	122.34	118.48
11. J/95-242	13.93	12.67	13.30	130.75	131.47	131.11
12. J/93-139	14.53	13.67	14.10	104.50	115.82	110.16
13. J/95-80	14.67	13.33	14.00	160.13	150.29	155.21
14. J/95-228	14.67	13.40	14.04	139.61	134.17	136.89
15. JW-160	15.27	15.07	15.17	126.93	128.58	127.76
16. PS/96-14	17.00	20.87	18.94	109.29	118.91	114.10
17. Kufri Anand	13.93	15.93	14.93	103.89	109.57	106.73
18. Kufri Ashoka	11.87	14.07	12.97	82.13	96.53	89.33
19. Kufri Bahar	14.27	15.73	15.00	101.13	106.03	103.58
20. Kufri Chipsona-1	12.60	14.07	13.34	68.23	94.69	81.46
21. Kufri Chipsona-2	13.80	15.20	14.50	82.05	92.87	77.47
22. Kufri Jawahar	14.87	12.53	13.70	105.93	115.82	110.88
23. Kufri Jyoti	12.60	14.07	13.34	86.02	99.95	92.99
24. Kufri Pukhraj	13.27	14.20	13.74	84.82	98.74	91.78
25. Kufri Sutlej	14.17	14.60	14.67	130.73	103.90	130.82
26. Kufri Pushkar	12.60	14.07	13.34	68.23	94.69	81.46
27. MS/99-1871	14.67	13.33	14.00	160.13	150.29	155.21
28. J/95-226	16.27	20.53	18.40	114.61	122.34	118.48
29. J/95-158	14.67	13.40	14.04	139.61	134.17	136.89
30. J/96-80	11.67	13.00	12.34	141.13	146.82	143.98
General mean	14.10	14.77	14.40	117.79	120.93	119.48
CD (P=0.05)	1.63	2.62	1.52	32.51	5.53	16.24

over two years exhibited the superiority of J/96-171 for leaf area (181.09 cm²) followed by J/92-159 (171.17 cm²). Eleven more genotypes expressed better values compared to population mean (119.48 cm²). Significantly inferior and minimum area was observed in Kufri Chipsona⁻¹ (81.46 cm²).and Kufri Pushkar (81.46 cm²)

Tuber weight (g) and tuber yield (q/ha)

The perusal of results drawn by pooling the two years performance (Table 4) indicates that significantly maximum tuber weight was observed in MS/99-1871

and J/95-80 (90.83 g each) followed by J/96-171 (90.67g). In total, sixteen genotypes surpassed the population mean (73.19g). The minimum tuber weight was recorded in J/95-242 (50.67 g). The results drawn by pooling two years mean performance revealed that significantly highest tuber yield was exhibited by Kufri Chipsona-1 and Kufri Pushkar (480.37 q/ha each) closely followed by J/93-139 (461.50q/ha) and Kufri Chipsona-2 (437.37 q/ha). The minimum tuber yield was observed in J/95-378 (234.12 q/ha) followed by J/95-242 (249.75 q/ha). In total sixteen genotypes surpassed the population mean (365.18 q/ha).

Table 4: Performance of potato genotypes for tuber weight and yield.

Genotypes	Tuber weight (g)			Yield (q/ha)		
	2007-08	2008-09	Pooled	2007-08	2008-09	Pooled
1. J/95-144	65.33	60.33	62.83	267.00	263.67	265.33
2. J/95-378	59.33	64.67	62.00	233.75	234.50	234.12
3. J/92-159	59.67	63.00	61.33	319.75	323.75	321.75
4. J/96-84	86.00	79.67	82.83	405.00	427.50	416.25
5. J/96-149	50.00	56.00	53.00	258.00	257.50	257.75
6. J/96-171	82.67	98.67	90.67	412.50	443.75	428.12
7. J/96-238	99.00	69.67	84.33	397.50	302.33	350.00
8. J/95-221	75.67	81.33	78.30	352.75	361.75	357.25
9. J/95-227	61.67	50.33	56.00	325.75	290.00	307.87
10. J/95-229	84.33	87.00	85.67	431.25	432.50	431.87
11. J/95-242	46.00	55.33	50.67	259.50	240.00	249.75
12. J/93-139	65.00	81.33	73.17	491.75	431.25	461.50
13. J/95-80	86.67	95.00	90.83	381.50	431.25	406.37
14. J/95-228	70.67	62.00	67.33	374.69	297.50	336.09
15. JW-160	56.00	66.00	61.00	394.75	371.25	383.00
16. PS/96-14	61.67	98.33	80.00	240.00	353.75	296.87
17. Kufri Anand	83.00	73.00	78.33	453.75	394.00	423.87
18. Kufri Ashoka	64.00	52.67	58.33	302.50	278.75	290.60
19. Kufri Bahar	57.33	75.00	67.17	335.25	315.00	323.12
20. Kufri Chipsona-1	72.67	84.67	78.67	498.75	462.00	480.37
21. Kufri Chipsona-2	73.33	81.67	77.50	419.25	455.50	437.37
22. Kufri Jawahar	84.33	79.33	81.83	442.75	388.75	415.75
23. Kufri Jyoti	77.00	67.67	72.33	264.00	336.92	300.41
24. Kufri Pukhraj	73.33	68.33	70.83	433.08	361.25	397.17
25. Kufri Sutlej	67.00	72.67	69.83	375.75	366.25	371.00
26. Kufri Pushkar	72.67	84.67	78.67	498.75	462.00	480.37
27. MS/99-1871	86.67	95.00	90.83	381.50	431.25	406.37
28. J/95-226	84.33	87.00	85.67	431.25	432.50	431.87
29. J/95-158	70.67	62.00	67.33	374.69	297.50	336.09
30. J/96-80	75.67	81.33	78.30	352.75	361.75	357.25
General mean	71.72	74.46	73.19	370.32	360.19	365.18
CD(P=0.05)	25.242	17.345	15.085	109.81	79.992	66.9154

Table 5: Performance of potato genotypes for specific gravity and tuber dry matter content.

Genotypes	Specific gravity (g/cm ³)			Tuber dry matter content (%)		
	2007-08	2008-09	Pooled	2007-08	2008-09	Pooled
1. J/95-144	1.048	1.044	1.046	13.55	15.32	14.43
2. J/95-378	1.026	1.009	1.048	16.13	15.20	15.67
3. J/92-159	1.038	1.027	1.033	16.20	16.22	16.21
4. J/96-84	1.033	1.066	1.050	15.08	15.22	15.15
5. J/96-149	1.027	1.032	1.029	13.71	14.61	14.17
6. J/96-171	1.031	1.042	1.036	15.03	17.46	16.25
7. J/96-238	1.050	1.047	1.050	13.96	17.52	15.74
8. J/95-221	1.047	1.025	1.036	16.92	16.32	16.62
9. J/95-227	1.052	1.051	1.052	14.37	18.88	16.63
10. J/95-229	1.044	1.034	1.039	15.03	16.25	15.64
11. J/95-242	1.059	1.083	1.071	20.39	19.60	19.99
12. J/93-139	1.063	1.093	1.078	17.93	17.62	17.78
13. J/95-80	1.042	1.037	1.039	14.74	15.26	15.00
14. J/95-228	1.075	1.063	1.069	15.69	13.19	15.44
15. JW-160	1.033	1.057	1.045	13.20	14.48	13.84
16. PS/96-14	1.035	1.026	1.030	16.59	15.74	16.16
17. Kufri Anand	1.043	1.026	1.035	16.97	17.38	17.18
18. Kufri Ashoka	1.044	1.033	1.039	15.19	14.74	14.97
19. Kufri Bahar	1.050	1.059	1.052	15.77	17.24	16.51
20. Kufri Chipsona-1	1.045	1.042	1.044	23.08	23.35	23.22
21. Kufri Chipsona-2	1.060	1.069	1.067	23.62	23.47	23.54
22. Kufri Jawahar	1.056	1.036	1.046	18.36	17.24	17.80
23. Kufri Jyoti	1.045	1.037	1.041	17.07	15.96	16.51
24. Kufri Pukhraj	1.035	1.074	1.054	14.35	14.30	14.32
25. Kufri Sutlej	1.040	1.035	1.038	15.08	16.45	15.77
26. Kufri Pushkar	1.045	1.042	1.044	23.08	23.35	23.22
27. MS/99-1871	1.042	1.037	1.039	14.74	15.26	15.00
28. J/95-226	1.044	1.034	1.039	15.03	16.25	15.64
29. J/95-158	1.075	1.063	1.069	15.69	13.19	15.44
30. J/96-80	1.047	1.025	1.036	16.92	16.32	16.62
General mean	1.05	1.04	1.05	16.45	16.78	16.68
CD(P=0.05)	0.026	0.043	0.025	2.136	1.484	1.281

Specific gravity of tuber (g/cm³) and tuber dry matter content (%)

Pooling of two years performance (Table 5) revealed that maximum specific gravity was recorded in J/93-139 (1.078 g/cm³) being at par with J/95-242 (1.071 g/cm³). Although fifteen more genotypes possessed more gravity compared to population mean (1.05 g/cm³). Pooled analysis recorded maximum dry matter content in Kufri Chipsona-2 (23.54%) followed by Kufri Chipsona-1 (23.22%) but significantly superior over rest. Eight other genotypes showed better dry matter content over population mean (16.68%) and

minimum content was recorded in JW-160 (13.84%) followed by J/96-149 (14.17%), Kufri Pukhraj (14.32%) and J/95-144 (14.43%) exhibiting at par values.

Total chlorophyll content (mg/100g fresh weight) and total soluble solids (%)

Pooled mean performance (Table 6) revealed that significantly highest chlorophyll content was exhibited by J/95-80 (1.59 mg) and Kufri Pukhraj (1.584 mg) followed by J/93-139 (1.583 mg) and J/96-80 (1.567 mg). As compared to population mean (1.46 mg) sixteen genotypes exhibited higher chlorophyll content.

Table 6: Performance of potato genotypes for total chlorophyll and total soluble solids.

Genotypes	Total chlorophyll content (mg/g fresh wt.)			Total Soluble Solids (^o B)		
	2007-08	2008-09	Pooled	2007-08	2008-09	Pooled
1. J/95-144	1.316	1.550	1.430	5.73	6.41	6.07
2. J/95-378	1.303	1.713	1.508	6.20	6.82	6.51
3. J/92-159	1.105	1.642	1.374	7.03	7.74	7.39
4. J/96-84	0.895	1.579	1.237	6.00	6.60	6.30
5. J/96-149	1.320	1.484	1.402	5.03	5.54	5.29
6. J/96-171	1.413	1.605	1.509	6.47	7.11	6.69
7. J/96-238	1.092	1.723	1.407	5.80	6.05	5.92
8. J/95-221	1.258	1.875	1.567	6.23	6.86	6.55
9. J/95-227	1.121	1.862	1.492	5.20	5.72	5.46
10. J/95-229	1.177	1.735	1.456	6.17	6.78	6.48
11. J/95-242	1.407	1.547	1.477	6.90	7.59	7.25
12. J/93-139	1.500	1.667	1.583	6.23	6.86	6.55
13. J/95-80	1.507	1.627	1.566	6.00	6.60	6.30
14. J/95-228	1.189	1.554	1.372	5.37	6.24	5.80
15. JW-160	1.163	1.826	1.496	6.43	7.08	6.76
16. PS/96-14	1.098	1.616	1.357	5.30	5.83	5.57
17. Kufri Anand	1.103	1.631	1.367	5.83	6.42	6.13
18. Kufri Ashoka	1.112	1.697	1.405	6.03	6.64	6.34
19. Kufri Bahar	1.395	1.613	1.504	6.00	6.60	6.30
20. Kufri Chipsona-1	1.200	1.631	1.415	7.03	7.50	7.27
21. Kufri Chipsona-2	1.332	1.818	1.575	6.33	7.30	6.97
22. Kufri Jawahar	1.155	1.556	1.355	6.50	7.15	6.83
23. Kufri Jyoti	1.157	1.782	1.469	6.30	6.93	6.62
24. Kufri Pukhraj	1.335	1.833	1.584	5.67	6.33	6.00
25. Kufri Sutlej	1.279	1.700	1.489	6.23	6.86	6.55
26. Kufri Pushkar	1.200	1.631	1.415	7.03	7.50	7.27
27. MS/99-1871	1.507	1.627	1.566	6.00	6.60	6.30
28. J/95-226	1.177	1.735	1.456	6.17	6.78	6.48
29. J/95-158	1.189	1.554	1.372	5.37	6.24	5.80
30. J/96-80	1.258	1.875	1.567	6.23	6.86	6.55
General mean	1.24	1.68	1.46	6.09	6.72	6.41
CD (P=0.05)	0.04	0.101	0.054	0.210	0.418	0.230

The minimum chlorophyll content was recorded in J/96-84 (1.237 mg). The results drawn by pooling the two years mean performance revealed that the maximum TSS content was present in J/92-159 (7.39°B) closely followed by at par values of Kufri Chipaona-1 and Kufri Pushkar (7.27 °B each) and J/95-242 (7.25°B). In total, fifteen genotypes exhibited better TSS in comparison to population mean (6.41 °B). The significantly least TSS content was registered in J/96-149 (5.29°B).

Ascorbic acid (mg/100g fresh weight) and protein content (%)

A perusal of pooled results of genotypes (Table 7), Kufri Bahar showed higher ascorbic acid content (27.18 mg) followed by Kufri Jyoti (26.48 mg). Lowest value was observed in J/95-221 and J/96-80 (15.05 mg each) followed by J/96-149 (16.42 mg) and J/93-139 (16.98 mg). The mean ascorbic acid content of population was 21.30 mg. Pooled analysis recorded the maximum protein content in J/95-144 (1.91) followed by Kufri Jawahar (1.86%). In addition to these genotypes, tuber of thirteen more genotypes had better protein content over population mean (1.45%). Minimum content was exhibited by J/96-84 (1.16%).

Table 7: Performance of potato genotypes for ascorbic acid and Protein content.

Genotypes	Ascorbic acid (mg/100g fresh wt.)			Protein content (%)		
	2007-08	2008-09	Pooled	2007-08	2008-09	Pooled
1. J/95-144	21.60	23.79	22.70	1.86	1.95	1.91
2. J/95-378	17.20	18.92	18.06	1.24	1.25	1.25
3. J/92-159	23.17	25.47	24.32	1.32	1.33	1.32
4. J/96-84	24.83	27.13	25.98	1.15	1.17	1.16
5. J/96-149	15.63	17.20	16.42	1.20	1.22	1.21
6. J/96-171	20.20	22.22	21.21	1.65	1.54	1.60
7. J/96-238	17.87	19.65	18.76	1.41	1.43	1.42
8. J/95-221	14.33	15.77	15.05	1.28	1.27	1.26
9. J/95-227	19.70	21.67	20.69	1.46	1.48	1.47
10. J/95-229	17.67	19.43	18.55	1.68	1.71	1.69
11. J/95-242	20.86	22.21	21.31	1.48	1.46	1.47
12. J/93-139	16.17	17.78	16.98	1.26	1.28	1.27
13. J/95-80	23.43	22.14	22.79	1.38	1.40	1.39
14. J/95-228	18.57	20.42	19.50	1.26	1.28	1.27
15. JW-160	23.20	25.52	24.36	1.24	1.25	1.25
16. PS/96-14	22.27	24.49	23.38	1.63	1.66	1.65
17. Kufri Anand	23.53	25.89	24.71	1.27	1.28	1.28
18. Kufri Ashoka	20.23	22.26	21.25	1.67	1.69	1.68
19. Kufri Bahar	26.20	28.15	27.18	1.71	1.73	1.72
20. Kufri Chipsona-1	20.37	22.40	21.39	1.44	1.46	1.45
21. Kufri Chipsona-2	20.83	22.92	21.88	1.77	1.85	1.81
22. Kufri Jawahar	21.03	23.14	22.09	1.84	1.87	1.86
23. Kufri Jyoti	25.20	27.75	26.48	1.17	1.18	1.17
24. Kufri Pukhraj	20.20	22.22	21.21	1.59	1.63	1.61
25. Kufri Sutlej	24.30	26.73	25.52	1.28	1.30	1.29
26. Kufri Pushkar	20.37	22.40	21.39	1.44	1.46	1.45
27. MS/99-1871	23.43	22.14	22.79	1.38	1.40	1.39
28. J/95-226	17.67	19.43	18.55	1.68	1.71	1.69
29. J/95-158	18.57	20.42	19.50	1.26	1.28	1.27
30. J/96-80	14.33	15.77	15.05	1.28	1.27	1.26
General mean	20.43	22.18	21.30	1.44	1.46	1.45
CD (P=0.05)	4.198	4.635	3.080	0.015	0.077	0.039

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