

## **Evaluation of promising potato (*Solanum tuberosum* L.) cultivars under West Bengal condition**

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Potato (*Solanum tuberosum* L.) belongs to the Solanaceae family of flowering plants. It originated and was first domesticated in the Andes Mountains of South America (Birhman and Kaul, 1989). In the present scenario of demographic shifts and climate change, quantum increase of production for resource-poor populations is an urgent priority. Farmers, especially those in developing countries like India needs to produce profitable and healthy crops and at the same time reduce their dependence on costly harmful pesticides. In West Bengal potato is one of the leading crop. So it is important to obtain best quality potato genotypes under West Bengal condition to increase yield per unit area. The present investigation was conducted for evaluation of potato genotypes showing excellence with respect to some visually observable morphological characters and biometrical characters concerned with yield. There were some easily observable morphological variations present within the genotypes with respect to stem pigmentation and tuber character for identification of desirable genotypes with markers characters, which may provide useful guidance in effective selection in the course of breeding works.

The field experiment of the present study was carried out during the *Rabi* season of 2010-2011 from 17<sup>th</sup> November 2010 to 11<sup>th</sup> March 2011 at the Block Seed Farm, Adisaptagram of Hooghly district in West Bengal, India. The experimental location of the place was situated at 22.57° N latitude and 88.20° E longitudes with an elevation of 7.8 meters from mean sea level. The climate of this region is sub tropical humid and the entire year can be classified into three distinct seasons namely Winter season, Summer season and Rainy season. Occasionally late monsoon rain in the month of October causes some hazards to the planting of potato. The maximum and minimum temperature during the experiment ranged from 24.38

- 34.42°C and 9.51 - 25.05°C, respectively. During the investigation period the maximum mean monthly temperature was 35.92°C in the month of March and the minimum mean monthly temperature was 12.54°C in the month of December. The daily mean temperature remained congenial to sustain crop growth and tuberization up to the middle of February and thereafter the temperature began to shoot up. Very low rainfall occurred during the investigation period. The monthly maximum and minimum relative humidity (RH) varied from 89.27 – 95.01 % and 40.13 – 70.11 % during the investigation period.

The experiment was conducted in RBD, with 3 replications. Each plot was represented by 10 rows of 3 meter length with a spacing of 60 × 20 cm. cv. K. Jyoti from farmer field taken as a local check variety for West Bengal condition because it seems to be promising yielder in West Bengal and freshly procured K. Jyoti from Kufri, Shimla was also evaluated as a designated material under Genetics-8 trial. Genetics-5 trial included tubers with old early maturing hybrids, Genetics-7 trial included tubers with old medium maturing hybrids and Genetics-8 trial included processing hybrids. Similarly K. Pukhraj was also included twice for its performance under Genetics-5 and Genetics-7 trial (procured from CPRI, Shimla). NPK was applied with a dose of 200: 150: 150 kg.ha<sup>-1</sup> respectively. Intercultural operations and plant protection measures were taken from time to time and as and when required. Germination was recorded after 30 days of planting. Plant height was measured from ground level to top of the highest branch at the time of 50 days of crop growth. Five plants were selected from each plot and each replication for recording plant height. Marketable yield, non-marketable yield, harvest index, total tuber yield, number of leaves/plant, leaflet/leaf, interjected leaflet, leaf angle to main axis, equatorial diameter, polar diameter and dry matter content were recorded. The morphological traits like stem pigmentation,

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branching Pattern, occurrence of flower, shape of tuber, colour of tuber, shape of eye etc. were visually observed.

Germination percentage was recorded 30 days after planting for all the 19 genotypes (Table 1). K. Ashoka showed maximum germination followed by MS/1-4353. Chipsona-2 exhibited lowest germination % followed by J/99-48 (Table 1). Leaves/plant was recorded at 50 days after planting. Highest number of leaves/plant was exhibited by MP/98-71 followed by Chipsona-3. The lowest number of leaves per plant was recorded by K. Khyati followed by J/99-48. This is a qualitative character which is measured here for evaluation for the physical appearance of the genotypes. Plant height was also recorded 50 days after planting. The maximum plant height was recorded after 50 days of planting by K. Khyati followed by MS/1-4353. The minimum height was recorded in K. Pukhraj (G7). K. Khyati also exhibited highest leaf area index followed by K. Pukhraj (G7) and lowest leaf area index was shown by MP/98-71 followed by K. Jyoti. Highest total tuber yield and marketable tuber yield were recorded in MS/1-4353. Highest non marketable tuber yield was highest in K. Bahar. K. Pukhraj (G7) showed maximum harvest index followed by K. Surya. Highest polar diameter was exhibited by cv. K. Jyoti followed by cv. K. Pushkar. K. Pukhraj (G7) exhibited highest equatorial diameter where cv. Chipsona-2 had lowest values for these characters. Highest dry matter % was recorded in cv. Chipsona-3 followed by MS/1-4906. Quality can be divided into external aspects, such as shape and size of tuber, surface defects, visible damage *etc.*, and internal aspects, such as dry matter content, sugar content, and internal defects and diseases. All these quality characteristics are governed by both the variety of potato and the conditions under which it is grown. Tuber size of the harvested product depends on the total tuber yield and the number of tuber per plot. The number of tubers per plot depends on the number of plant per plot. Number of tubers per plant are also influenced by variety. In addition, it should be noted that fewer tubers are usually formed in heavy hard soil than on light soil. Conditions during the period of tuber formation also play an important role although really do not know exactly are the best conditions for the formation of a large number of tubers. In any case it would seem that neither extreme dryness nor undue moisture would flavour it. The principal means of getting higher marketable tuber yield conditions are good pre-germination, provision

of a good, moist seed bed and avoidance of damage to sprouts during planting. (Zaag, 2003)

Green stem pigmentation was observed in most of the genotypes except MS/1-4353, cv. K. Bahar, K. Pushkar, Chipsona-3, MP/98-71 and K. Surya where stem was found to be brownish green (Table 2). The genotypes remained erect up to 70 days of growth while cv. K. Ashoka was found spreading all along the growth period the growth period. The genotypes like cv. K. Khyati, 2001-P-26; cv. K. Bahar, cv. Chipsona-1, cv. Chipsona-3, MP/98-71 and cv. K. Surya remained erect up to 30 days and changed to spreading within 70 days of growth. This parameter was study to evaluate the behavior and condition of plant before and after tuberization. This is a morphological parameter to study the behavior of the plant. What is the implications of erect stems. Flower appeared from 30 days in the flowering genotypes like J/99-242, 2001-P-26, MS/1-4353, cv. K. Jyoti and cv. K. Jyoti (G8) and the rest genotypes did not flower at all. MacDonald, -D-M (1991) showed those with pink sprouts, white tubers and white flowers form the largest yielding group. Shape of tubers of thirteen genotypes J/99-48, K. Pukhraj (G5), 2001-P-26, cv. K. Khyati, cv. K. Pushkar, cv. K. Pukhraj (G7), cv. K. Bahar, cv. K. Jyoti, cv. Chipsona-1, 2, 3, cv. K. Jyoti & cv. Atlantic were oval and others like J/99-242, K. Ashoka, MS/1-4353, MS/1-4906, MP/98-71 and cv. K. Surya had round shaped tuber. Round shaped tuber is preferable by the consumer (Herman *et al.*, 1994). Deep seated eyes were found in J/99-48, cv. K. Ashoka, and cv. K. Pukhraj and that in J/99-242, MS/1-4353 were medium and other genotypes had shallow eyes. Colour of tubers was either white (light brown) or brown. The genotypes J/99-242 and 2001-P-26 had white and the rest other genotypes had brown tubers. White colour (actually very light brown) tuber has high market values as well as consumer preferable when the potato is expose to the sun green areas develop on the tuber. The green portions taste bitter because they contain a moderately poisonous alkaloid called glycoalkaloid so potato free from such defects is consumer preferable (Valkonen *et al.* 1996). Skin surface of the tubers was smooth in J/99-242, cv. K. Khyati, cv. K. Pushkar, cv. K. Jyoti, MP/98-71, cv. K. Jyoti (G8) & Atlantic and rough in cv. K. Pukhraj (G7), cv. K. Bahar, K. Jyoti, cv. Chipsona-1, 2, 3, J/99-242, cv. K. Ashoka, cv. Chipsona-1, 2, 3, 2001-P-26, MS/1-4353, MS/1-4906, MP/98-71 and K. Surya. Tubers with smooth skin surface have also high marketable value along with consumers liking. Shape of eye may vary from circular, semi

Table 1: Yield attributing characters and its mean performance

Genotypes	Germination (%)	Leaves at 50 DAP	Plant height at 50 DAP (cm)	Leaf area index	Total tuber yield Kg plot <sup>-1</sup>	Marketable tuber yield (Kg plot <sup>-1</sup> )	Non marketable tuber yield (Kg plot <sup>-1</sup> )	Harvest index	Diameter (mm.)		Dry matter (%)
									Polar	Equatorial	
J/99-48	54.220	13.300	46.515	0.252	13.367	12.933	0.433	68.333	62.916	55.498	15.795
J/99-242	65.775	14.667	45.188	0.241	17.984	17.183	0.800	65.500	51.811	51.036	18.531
K. Ashoka	95.748	12.633	47.000	0.237	20.617	18.333	2.283	68.500	57.160	51.816	17.428
K. Pukhraj(G5)	89.550	14.533	43.186	0.278	16.300	15.600	0.700	63.166	62.013	51.968	17.233
K. Khyati	92.663	12.583	58.451	0.348	22.483	20.333	2.150	65.500	63.988	56.960	16.943
2001-P-26	48.662	14.600	42.906	0.261	14.667	14.450	0.216	67.166	64.593	54.066	17.880
MS/1-4353	95.106	15.566	57.858	0.218	30.450	28.583	1.867	64.666	59.323	50.142	17.565
MS/1-4906	75.552	15.333	53.310	0.225	23.000	21.583	1.666	64.833	62.085	51.678	22.157
K. Pushkar	75.996	13.367	46.433	0.220	26.250	24.366	1.883	68.666	65.078	46.391	19.660
K. Pukhraj(G7)	73.551	14.242	36.891	0.227	24.933	23.650	1.283	81.500	57.775	57.658	17.556
K. Bahar	89.106	13.700	46.885	0.253	23.984	21.800	2.550	76.333	58.885	50.016	20.505
Check K. Jyoti	77.330	13.566	49.963	0.203	23.800	22.700	1.100	77.166	70.893	55.902	18.676
Chipsona-1	66.650	15.966	55.028	0.253	25.150	24.250	0.900	70.167	60.123	45.788	18.776
Chipsona-2	50.633	14.466	49.551	0.246	15.800	15.216	0.583	75.333	52.505	39.640	19.255
Chipsona-3	74.433	15.983	53.866	0.205	22.700	22.216	0.483	66.000	53.963	46.691	23.635
MP/98-71	83.066	16.200	67.071	0.183	20.450	19.892	0.558	60.666	59.055	51.537	18.7665
K. Surya	64.455	13.833	48.560	0.255	24.867	24.050	0.816	78.333	64.813	57.513	21.490
K. Jyoti(G8)	76.416	17.533	52.213	0.208	22.200	21.583	0.650	78.500	51.850	41.780	18.430
Atlantic	80.166	14.433	49.092	0.258	17.534	16.666	0.867	58.333	55.041	45.935	18.751
<b>SEm(±)</b>	<b>75.214</b>	<b>13.695</b>	<b>48.186</b>	<b>0.222</b>	<b>0.9022</b>	<b>0.895</b>	<b>0.351</b>	<b>2.038</b>	<b>2.205</b>	<b>2.168</b>	<b>0.099</b>
<b>LSD(0.05)</b>	<b>4.913</b>	<b>1.232</b>	<b>4.072</b>	<b>0.037</b>	<b>2.586</b>	<b>2.568</b>	<b>1.006</b>	<b>5.846</b>	<b>6.323</b>	<b>6.219</b>	<b>0.283</b>

DAP - Days after planting

Table 2: Qualitative characters of 19 different genotypes of potato

Genotypes	Stem pigmentation	Branching pattern		Presence of flower		Shape of the tuber	Type of eye	Skin colour of tuber	Surface of tuber	Shape of eye
		30 DAP	70 DAP	30 DAP	70 DAP					
J/99-48	Green	Erect	Erect	No	No	Oval	Very Deep	Deep Brown	Rough	Crescent
J/99-242	Green	Erect	Erect	Yes	Yes	Round	Deep	Light brown	Smooth	Semi-Circular
K. Ashoka	Green	Spreading	Spreading	No	No	Round	Very deep	Deep brown	Rough	Circular
K. Pukhraj (G5)	Green	Erect	Erect	No	No	Oval	Very deep	Medium brown	Rough	Circular
K. Khyati	Green	Erect	Spreading	No	No	Oval	Shallow	Medium brown	Smooth	Crescent
2001-P-26	Green	Erect	Spreading	Yes	Yes	Oval	Medium	Light brown	Rough	Circular
MS/1-4353	Brownish Green	Erect	Erect	Yes	Yes	Round	Deep	Deep brown	Rough	Circular
MS/1-4906	Green	Erect	Erect	No	No	Round	Medium	Deep brown	Rough	Semi-Circular
K. Pushkar	Brownish Green	Erect	Erect	No	No	Oval	Shallow	Medium brown	Smooth	Circular
K. Pukhraj (G7)	Green	Erect	Erect	No	No	Oval	Very deep	Deep brown	Rough	Circular
K. Bahar	Brownish Green	Erect	Spreading	No	No	Oval	Shallow	Deep brown	Rough	Circular
Check K.Jyoti	Green	Erect	Spreading	Yes	Yes	Oval	Shallow	Medium brown	Smooth	Circular
Chipsona-1	Green	Erect	Spreading	No	No	Oval	Shallow	Medium brown	Rough	Circular
Chipsona-2	Green	Erect	Erect	No	No	Oval	Shallow	Deep brown	Rough	Circular
Chipsona-3	Brownish Green	Erect	Spreading	No	No	Oval	Shallow	Deep brown	Rough	Semi-Circular
MP/98-71	Brownish Green	Erect	Spreading	No	No	Round	Shallow	Medium brown	Smooth	Semi-Circular
K. Surya	Brownish Green	Erect	Spreading	No	No	Round	Medium	Medium brown	Rough	Semi-Circular
K. Jyoti (G8)	Green	Erect	Erect	Yes	Yes	Oval	Shallow	Medium brown	Smooth	Circular
Atlantic	Green	Erect	Erect	No	No	Oval	Shallow	Medium brown	Smooth	Semi-Circular

(DAP- Days after Planting)

circular or crescent shape. Among these shapes of eye the crescent shaped eye is very often favourable. The number of eyes in a tuber varies considerably depending on many factors such as variety, size of tuber and growth conditions. The sheath surrounding the buds in the eye is a rudiment of a leaf. The eye is, in fact, the axil of a leaf on part of a stem in many cases the main bud lies in the middle of the eye, with a bud on either side, often clearly separated by tuber flesh. These side buds may be regarded as the lowest lateral buds of a sprout, which have become separated by the growth of the tuber. Normal sprouts can, and often do, grow from them. So the half moon shape eye is preferable than rest of the other shapes( Zaag, 2003). K.Khayti was the only variety among all these genotypes showed the crescent shaped eyes.

Germination percentage, plant height and leaf area index are the yield attributing parameters. Genotypes like MS/1-4353, K.Pushkar, K.Surya, Chipsona-1, K.Bahar, K.Pukhraj (G7) are very promising yielder for West Bengal condition. In order to exploit the full potentiality of the varieties, varietal selection is an important task. Due to the presence of enough and wide genetic variation among the genotypes there is a

good scope of selection for improved genotypes having good yield as well as qualitative characters.

Only statement of the result provided in tables is not going to interpret your results. Try to discuss your results in the light of previous work and also on scientific merit.

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