

## **Yield Stability of Potato Genotypes for Rainfed Cultivation in North Karnataka**

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**Abstract:** Experiments were conducted in *Kharif* season from 1993-1995 to identify a stable high yielding potato genotype under medium and late maturity group for rainfed vertisol conditions. Pooled analysis of variances indicated significant differences among the genotypes environments and genotype X environmental interaction. '85-P-718' was more stable which consistently showed higher yield while 'JX-118' and 'MS/85-163' were adapted to favourable environment under the medium maturity group. In the late maturity group, 'MS/85-163' was found stable but 'Kufri Badshah' was still a best performer. 'JX-115' showed high yield and had the ability to perform well in all the environmental conditions under both the maturity groups.

### **Introduction**

Potato (*Solanum tuberosum* L.) is an important tuber crop grown on an area of 45,000 hectares in Karnataka. It is being cultivated as a rainfed crop during *Kharif* in vertisols in northern transitional zone of Dharwad and Belgaum districts. 'Kufri Chandramukhi' is the leading variety grown in this tract. Of late many better yielding varieties/genotypes have been developed and there is need for identifying stable variety for this cropping situation. Varietal adaptability to environmental fluctuations is important for the stabilization of crop production over years. Adaptability is the ability of a genotype to produce a relatively narrow range of phenotypes in different environments. Stability reflects the suitability of a variety for general cultivation over a wide range of environments with sustained production (Singh and Narayanan, 1993). Hence, experiments were undertaken to identify stable genotypes under medium and long maturity category for rainfed conditions on vertisols.

### **Material and Methods**

The experiment included evaluation of 35 potato genotypes received from Central Potato Research Institute, Shimla. The experiment was carried out at the Main Research Station, UAS, Dharwad during *Kharif* 1993, 1994 and 1995 under rainfed conditions on vertisols. The rainfall

received during 1993, 1994 and 1995 was 799.3 mm, 779.84 mm and 790.8 mm, respectively. The meteorological data for 1993-95 is given in table-1. The trials were laidout in Randomized Block Design with three replications following a spacing of 60 cm x 20 cm. The crop was given 100:75:100 kg NPK/ha. 'Kufri Chandramukhi' was the check for medium maturity group in which haulms were cut at 75 days after planting (75 DAP) while 'Kufri Badshah' was the check for late maturity group where haulms were cut at 90 DAP. All other management practices including earthing up and prophylactic sprays were carried out as per the recommendations. The tubers were harvested 15 days after haulm cutting. The data on tuber yield were recorded and the difference tested for statistical significance following 'F' test each year and for pooled analysis over years for genotypes that were common in all the three years. The stability parameters were worked out as outlined by Eberhart and Russel (1966).

### **Results and Discussion**

A pooled analysis of variances revealed the existence of significant genetic variation among the genotypes with respect to marketable tuber yield in both the medium (Table 2) and late (Table 3) maturity groups. Different years analysis of variances showed significant differences amongst genotypes in medium (Table 3) maturity

Table 1. Meteorological data of 1993-95 at UAS, Dharwad

Month	Rainfall (mm)			Mean Temperature (°C)						Relative Humidity (%)		
	1993	1994	1995	Maximum		Minimum				1993	1994	1995
January	0.00	8.00	5.20	30.0	29.2	27.7	13.6	14.5	13.7	84.0	81.0	83
February	0.00	0.00	0.00	31.7	31.8	32.6	14.8	16.1	16.7	75.0	76.0	73
March	0.00	0.00	0.00	34.4	36.0	35.0	18.1	19.1	19.1	70.0	68.0	68
April	16.20	55.60	20.60	37.1	35.0	36.8	20.4	19.9	21.3	65.0	69.0	66
May	101.70	28.00	56.60	36.2	36.5	33.8	21.3	21.3	21.3	66.0	66.0	68
June	88.50	86.00	143.40	30.1	28.1	31.4	20.3	20.9	22.1	78.0	83.0	75
July	166.00	296.14	184.40	27.4	25.0	27.1	20.9	20.6	21.0	89.0	93.0	87
August	68.10	89.30	50.50	26.3	25.6	28.1	20.5	20.6	20.7	88.0	91.0	86
September	44.60	52.60	121.60	28.4	27.5	28.3	20.1	19.2	20.6	86.0	86.0	82
October	266.20	164.20	127.50	29.9	29.0	29.3	21.0	20.1	20.0	84.0	83.0	80
November	8.40	0.00	81.00	28.9	28.0	28.1	17.3	16.4	15.2	81.0	85.0	81
December	39.60	0.00	0.00	26.7	28.0	29.4	13.7	12.4	13.5	82.0	84.0	77
Total	799.30	779.84	790.80									

# Yield Stability of Potato.....

Table 2. Tuber yield (t/ha) of medium maturity (75 days) potato genotypes and their regression co-efficients under rainfed conditions in vertisols of Dharwad

Sl.	Tuber yield (t/ha) over				bi	S <sup>2</sup> d	
No.	Genotypes	Seasons (E)					
		1993	1994	1995			Pooled
1.	JX-118	13.76	18.71	10.66	14.37	1.16	-2.31
2.	85-P-670	8.82	11.70	5.70	8.74	0.88	-3.64
3.	85-P-718	15.70	21.52	13.53	16.92	1.14	-0.09
4.	JX-115	20.28	16.79	15.87	17.65	0.18	6.35
5.	JX-123	13.60	14.91	7.17	11.89	1.16	-0.83
6.	85-P-621	5.19	13.40	4.13	7.57	1.31	7.81
7.	MS/85-163	15.71	25.72	9.33	16.72	2.31	1.70
8.	Kufri Chandramukhi	17.81	11.94	13.79	14.51	-0.21	13.33
Mean		13.86	16.83	9.99	13.56		
Environmental Index (I)		+0.30	+3.27	-3.57			
S.E.m± for (G)		2.53	1.36	1.65	1.26		
C.D. at 5% (G)		7.68	4.14	5.01	3.59		
C.V. (%)		31.66	14.05	28.63	27.95		
S.E.m± for (E)		0.77					
C.D. at 5% (E)		2.20					
S.E.m± for (GXE)		2.19					
C.D. at 5% (GXE)		6.23					

groups. Different years analysis of variances showed significant difference amongst genotypes in medium and except in 1994 under the late maturity group for tuber yield. The effect of environments also differed significantly from one another in both the groups. Further, a significant genotype X environment interaction existed in the medium maturity group indicating specificity of certain genotypes to specific environments. Eberhart and Russell (1966) defined a stable variety as one with a high mean yield, a regression coefficient of unity ( $bi = 1$ ) and a minimum deviation from the regression line ( $S^2d=0$ ). Results

on mean tuber yield (t/ha), regression coefficient (bi) and least deviation from regression ( $S^2d$ ) are given in table 2 for the medium maturity group and for the late maturity group in table 3.

In the medium maturity group, 'JX-115' recorded highest yield of 20.28t/ha in 1993 and 15.87 t/ha in 1995 as well as pooled mean yield (17.65 t/ha) while in 1994, 'MS/85-163' recorded the highest yield of 25.72 t/ha. The environmental index was more favourable in 1994 ( $I = +3.27$ ) with a highest mean yield of 16.83 t/ha and it was less favourable in 1995. The higher yielding

Table 3. Tuber yield of late maturity (90 days) potato genotypes and their regression co-efficients under rainfed conditions in vertisols of Dharwad

Sl.	Tuber yield (t/ha) over				bi	S <sup>2</sup> d	
No.	Genotypes	Seasons (E)					
		1993	1994	1995			Pooled
1.	JX-115	26.56	22.44	18.35	22.45	0.87	37.64
5.	JX-123	17.58	19.24	6.74	14.52	0.44	15.52
6.	MS/85-163	18.95	26.25	8.76	17.99	1.20	1.33
7.	MS-P-621	9.32	14.26	4.94	9.51	1.63	-6.85
8.	Kufri Badshah	18.22	30.67	20.44	23.11	0.86	-6.08
	Mean (E)	18.18	22.57	11.84	17.51		
	Environmental Index (I)	1.67	5.06	-5.67			
	S.E.m± for (G)	2.08	3.56	1.14	1.51		
	C.D. at 5% (G)	6.79	NS	3.73	4.39		
	C.V. (%)	19.90	29.64	16.73	25.94		
	S.E.m± for (E)	1.17					
	C.D. at 5% (E)	3.40					
	S.E.m± for (GXE)	2.62					
	C.D. at 5% (GXE)	NS					

E = Environment, G = Genotypes.

GXE = Genotype × Environment interaction

bi = Co-efficient of regression

S<sup>2</sup>d = Deviations from coefficient of regression line

genotypes '85-P-718' were found most stable as deviation from the regression was near zero ( $S^2d = -0.09$ ) and regression remaining near unity ( $bi = 1.14$ ). High yielding 'MS/85-163' is considered unstable because of higher 'bi', higher deviations from zero and responsive to favourable environment. High yielding 'JX-115' is considered unstable due to the low co-efficient of regression, larger deviations from the regression, though it was better suited to favourable environmental conditions. Genotype 'JX-118' with yield higher than the mean, co-efficient of regression of regression near unity and deviations from regression being low, is considered unstable as

it is responsive to favourable environment while 'Kufri Chandramukhi' though with higher mean yield but had less than unity 'bi' value and higher deviations from regression is unstable even though it performed well under favourable environments. Figure 1. shows the performance and responsiveness of all the genotypes under medium maturity group.

Under the late maturity potato group (table 3), environmental index of 1994 was more favourable ( $I = +5.06$ ) with the highest mean yield of 22.57 t/ha like in medium maturity category. 'JX-115' recorded maximum yield (26.56 t/ha) in 1993 while 'Kufri Badshah' recorded highest

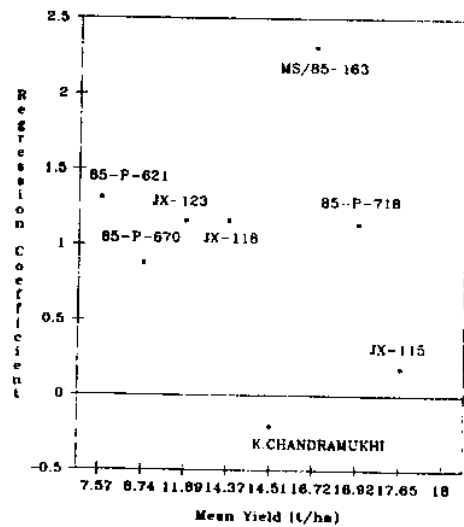


Fig 1. Distribution of medium maturing potato genotypes by their mean yield

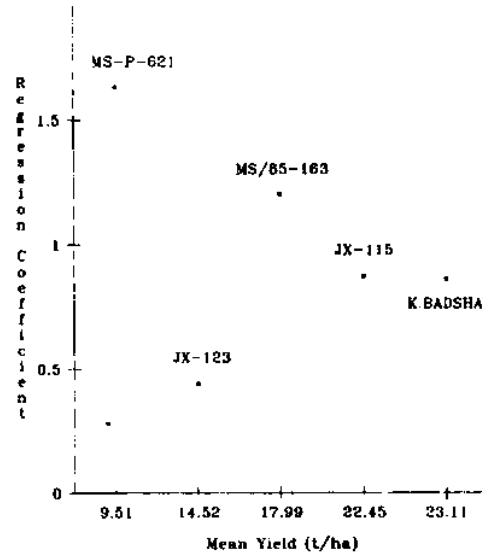


Fig 2. Distribution of late maturing potato genotypes by their mean yield

yields in 1994 and 1995 as well as the maximum pooled mean yield of 23.11 t/ha. 'MS/85-163' is considered as stable genotype as it has coefficient of regression near unity and lower deviations from regression along with yield higher than the mean. The high yielding 'Kufri Badshah' though having moderate desirable co-efficient of regression and higher deviation from regression line is considered unstable even though it

performed well under unfavourable environment too. Figure 2 shows mean potato yield and regression coefficient in the late maturity potato genotypes.

'JX-115' though found to be unstable under both the medium and late maturity group has higher mean yield and is suited for favorable environmental condition.

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