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# Stability analysis of potato cultivars for Kharif cultivation in Koraput region of Odisha

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## ABSTRACT

Stability analysis helps in understanding the adaptability of genotypes over different environmental conditions and identification of adaptable genotypes. The objective of the present study was to determine stable potato genotypes for off-season potato cultivation in Koraput region of southern Odisha. Sixteen varieties were evaluated for ten characters during Kharif season of 2014 and 2015 for stability parameters. Kufri Pukhraj, Kufri Lalit and Kufri Jyoti with mean tuber weight of 28.94, 28.96 and 29.67 g respectively showed stability in average tuber weight over all the locations. The mean values of tubers/plant indicated that Kufri Ashok variety was highest (7.81) while Kufri Arun was lowest yielding genotype (4.93). Highest mean value for tuber yield was recorded for variety Kufri Lalima (133.2) while Kufri Arun (84.2) had least mean value. The set of genotypes viz Kufri Lalima, Kufri Pukhraj, Kufri Lalit, Kufri Jyoti, Kufri Ashok and Kufri Chipsona 3 were found to be widely adapted to all the locations. For marketable yield Kufri Pukhraj and Kufri Jyoti had highest mean value of 107.4 and 107.3 respectively. Of the 16 varieties evaluated for 10 characters, Kufri Lalit, Kufri Lalima, Kufri Pukhraj and Kufri Jyoti were found to be stable for 8, 7, 8 and 7 characters respectively. These varieties can be recommended to farmers for cultivation for off-season (Kharif) potato cultivation in Koraput region. Kufri Chipsona 1 and Kufri Surya were adapted to favourable environment only due to their specific characteristics.

**Keywords:** Stability; potato; off-season; genotype-environment interaction

## INTRODUCTION

In India potato (*Solanum tubersom* L) is grown in an area of 2.02 million hectares with a production of 46.3 MT and productivity of 22.7 tons/ha (Anon 2014a). The leading states in potato production are Uttar Pradesh, West Bengal, Bihar, Odisha and Madhya Pradesh. In Odisha potato is cultivated in an area of 14990 ha with a production of 249 MT mostly concentrated in Rabi season. In Koraput district of Odisha potato is grown in an area of 1000 ha with

a production of 850 tons. The productivity of this crop is far below (8.5 tons/ha) the national average (22.5 tons/ha) (Anon 2014b). Koraput region of Odisha comes under eastern Ghat high land zone of India receiving an average annual rainfall of 1450 mm. During southwest monsoon a larger chunk of medium sloping lands remains fallow despite having good potential to support vegetable production even under heavy rainfall otherwise leading to water erosion-based soil-nutrient losses (Dass et al 2008).

Under irrigated conditions, potato raised in Koraput region is normally planted in second week of November and harvested from mid-February to March. Potato growers often face the problem of glut and lower market price mainly due to bulk arrival of potatoes from other states during this peak period. To avoid this situation some farmers are growing an early crop of potato (Kharif season) and sell it before normal harvesting season which fetches them premium prices.The agro-climatic conditions of Koraput are suitable for Kharif potato cultivation. Rise in prices of potato has propelled farmers to increase its area under cultivation during Kharif season. The limitation of suitable variety for Kharif season has made farmers to probe for good high yielding varieties of potato during off-season.

Although a number of varieties have been recommended for the cultivation of potato in Rabi season, the information on the stable varieties for the off-season (Kharif) is lacking. Phenotypically stable genotypes are of great importance because the environmental conditions vary from year to year and region to region. Wide adaptation to the particular environment and consistent performance of recommended genotypes is one of the main objectives in breeding programme. Tuber yield in potato is influenced by genotype and environment interaction. The information on the stable potato varieties, hybrids and exotic germplasm is lacking for exploitation under eastern Ghat highland zone (Koraput region). Therefore an experiment was conducted considering necessity to evaluate and screen the potential varieties of potato giving consistent performance over different locations of the region and to select the genotypes on the basis of stability parameters for important yield and yield attributing traits.

## MATERIAL and METHODS

**Location of site:** Southern Odisha comprises amalgamation of hills with an altitude of 950 m in Koraput region. Climate of the study area is sub-tropical and sub-humid type with mean annual maximum and minimum temperature of 30.6 and 17.0°C respectively. Mean annual rainfall of the area is 1450 mm of which 80 per cent is received during June to October. The 16 genotypes used in the study included released varieties/ hybrids of potato, *Solanum tuberosum* sub

sp *tuberosum*. These were evaluated under four environments (Table 2) for two years (2014 and 2015) during Kharif season. The locations were diverse in climate and altitude having scope of off-season potato cultivation.

**Genetic material:** Varieties for the study were obtained from the AICRP on Potato Centre, Orissa University of Agriculture and Technology, Odisha, Bhubaneswar. Each trial was laid out in a randomized complete block design with three replications. Each genotype in a replication was planted in a row spaced at 20 cm within rows and 60 cm between rows. Fertilization, weeding, other cultural practices and need-based plant protection measures were followed as recommended for Kharif season cultivation.

**Data analysis:** Data were recorded on shoots/plant, plant height (cm) 30 and 60 days after planting (DAP), leaflets, leaf area ($cm^2$), tuber number/plant, average tuber weight (g), tuber dry matter (%), total tuber yield (q/ha) and marketable tuber yield (>20 g tuber, q/ha). Tuber dry matter was estimated by oven drying 100 g of chopped tubers to a constant weight at 105°C from composite samples drawn immediately after harvest. Pooled stability analysis was done by following Eberhart and Russell (1966). They discussed stability of genotypes in terms of 3 parameters namely genotypic mean (gi), regression coefficient (bi) and deviation from the regression ($S^2di$). According to this model an ideal or most stable genotype is the one having high mean performance, unit regression and no deviation from regression.

## RESULTS and DISCUSSION

**Variance analysis:** Pooled ANOVA for stability of the quantitative traits at 4 locations is mentioned in Table 1. The analysis of variance revealed that mean sum of squares (MSS) due to genotypes (G) and environments (E) was highly significant for all the characters under study. This indicates the presence of substantial variation among the genotypes over environments. MSS due to G x E interaction was recorded significant for all characters except for plant height at 30 and 60 DAP, total leaflets/plant and tubers/plant. Significant G x E interaction indicated that genotypes under different environments behaved differently for the expression of characters of interest. It means that a particular genotype may not exhibit the same phenotypic performance under different environments and may respond differently to a specific environment for a character.

The MSS due to environment (linear) was significant for all the characters indicating that environmental effects are additive. The linear component of G x E interaction was also significant for all the characters under study except plant height at 30 and 60 DAP, total leaflets/plant and tubers/plant indicating significant rate of

Table 1. Pooled analysis of variance for different characters (2014 and 2015)

| Parameter | df | Mean square | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Shoots/ plant | Plant height (cm) at 30 DAP | Plant height (cm) at 60 DAP | Total leaflets/ plant | Leaf area ($cm^2$) | Tubers/ plant | Tuber dry matter (%) | Average tuber weight (g) | Total tuber yield (q/ha) | Marketable yield (q/ha) |
| Genotype | 15 | 0.83** | 10.10** | 12.78* | 3365** | 1366** | 5.64** | 10.07** | 22.83** | 716.2** | 552** |
| Environment | 3 | 0.72** | 124.0** | 39.65** | 2684** | 378** | 1.01** | 17.48** | 103.0** | 380.0** | 321** |
| Genotype × environment | 45 | 2.63** | 2.63 | 2.83 | 85 | 18.6* | 0.041 | 0.72* | 2.74** | 19.6* | 13.2* |
| Environment (linear) | 1 | 2.17** | 372** | 118.96** | 8050** | 1135** | 3.05** | 52.44** | 309** | 1140** | 963.8** |
| Environment x genotype (linear) | 15 | 0.027** | 2.00 | 3.43 | 94.7 | 32.07** | 0.064 | 0.73* | 6.28** | 36.6** | 18.94** |
| Pooled error | 120 | 0.009 | 3.18 | 3.49 | 119.5 | 10.76 | 0.040 | 0.41 | 0.48 | 10.82 | 7.96 |
| Pooled deviation | 32 | 0.020** | 2.76 | 2.34 | 74.9 | 11.11 | 0.03 | 0.67* | 0.91** | 10.47 | 9.70 |

*, **Significant at 5% and 1% probability level respectively, DAP= Days after planting, df = Degree of freedom

Table 2. Environmental indices of different characters in potato varieties over different locations

| Character | Location | | | |
|---|---|---|---|---|
| | Nandapur | Semiliguda | KVK farm | Jeypore |
| Shoots/plant | 0.242 | 0.027 | 0.008 | -0.277 |
| Plant height (cm) at 30 DAP | 3.207 | 0.934 | -0.743 | -3.397 |
| Plant height (cm) at 60 DAP | 1.258 | 0.695 | 0.393 | -2.346 |
| Total leaflets/plant | 15.97 | -1.581 | 1.232 | -15.62 |
| Leaf area ($cm^2$) | 4.074 | 2.193 | 0.733 | -7.000 |
| Tubers/plant | 0.220 | 0.095 | 0.047 | -0.362 |
| Tuber dry matter (%) | 0.857 | 0.242 | 0.420 | -1.519 |
| Average tuber weight (g) | 2.692 | 0.642 | 0.078 | -3.413 |
| Total tuber yield (q/ha) | 3.626 | 2.923 | 0.476 | -7.025 |
| Marketable yield (q/ha) | 3.145 | 2.639 | 0.759 | -6.543 |

linear response of the genotypes to environmental changes for these characters. The pooled deviation remained non-significant for most of the characters except shoots/plant, tuber dry matter and average tuber weight. This indicates that linear component of G x E interaction was predominant. Similar results are reported by Patel et al (2008) and Mane et al (2010). Environmental indices of all the locations are presented in Table 2 which indicate the performance of different environments. Environmental indices indict that for most of the characters Nandapur location was the best environment and Jeypore was least suited environment for off-season (Kharif) potato cultivation in Koraput region of Odisha.

**Shoots per plant:** Total number of shoots per plant varied significantly among different varieties with variety Kufri Lalima registering maximum mean value of 3.18 shoots per plant while least value of 1.94 was observed in Kufri Arun (Table 3). The mean value over the environments (locations) was 2.62. Nandapur location registered the maximum value of environment indices (0.242) while the least value was in Jeypore condition (-0.277). Only four genotypes viz Kufri Lalit, Kufri Jyoti, Kufri Chipsona 3 and Kufri Pushkar showed stability over the 4 locations with non-significant deviation from regression. Remaining all genotypes had low mean values and were poorly adapted to all locations. The results agree with the work of Joseph et al (2005).

**Plant height:** The locations varied with regard to plant height at 30 as well as 60 DAP. This is visible with varied value of environmental indices (Table 2). However Nandapur location registered maximum values of 3.20 and 1.25 while Jeypore location gave values -3.39 and -2.35 for

Table 3. Stability parameters for different characters in Kharif potato (pooled data of 2014 and 2015)

| Genotypes | Shoots/plant | | | Plant height (cm) 30 DAP | | | Plant height (cm) 60 DAP | | | Total leaflets/plant | | | Leaf area ($cm^2$) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | bi | $S^2di$ | Mean | bi | $S^2di$ | Mean | bi | $S^2di$ | Mean | bi | $S^2di$ | Mean | bi | $S^2di$ |
| Kufri Kanchan | 2.15 | 1.42** | 0.008 | 28.7 | 1.25** | -1.67 | 40.4 | 1.76* | -2.49 | 116 | 1.22** | -49 | 67 | 1.03** | 5.38 |
| Kufri Pukhraj | 3.17 | 0.64** | 0.001 | 30.4 | 1.00** | 0.15 | 41.6 | 1.13* | -0.21 | 141 | 0.48* | -80 | 108 | 0.62 | 0.04 |
| Kufri Chipsona 3 | 3.01 | 0.34 | 0.013 | 34.0 | 0.68 | 2.53 | 44.5 | 0.59 | -2.18 | 233 | 1.10** | -113 | 104 | 0.57** | -10.37 |
| Kufri Badshah | 2.42 | 1.44** | 0.011 | 29.9 | 0.99** | -2.44 | 39.3 | 0.43 | -2.48 | 122 | 1.11** | -82 | 70 | 0.65 | -1.04 |
| Kufri Arun | 1.94 | 0.96** | 0.005 | 29.7 | 1.13** | -3.14 | 39.4 | 1.28* | -3.07 | 139 | 1.84** | -38 | 65 | 1.28** | -4.47 |
| Kufri Ashok | 2.91 | 0.93** | 0.004 | 29.0 | 1.09** | -3.08 | 40.8 | 0.08 | 1.53 | 143 | 1.45** | 28 | 103 | 0.47** | -10.20 |
| Kufri Chipsona 1 | 2.06 | 0.95* | 0.028* | 32.3 | 0.28 | 1.75 | 43.3 | 0.77 | -1.17 | 173 | 1.26** | -96 | 99 | 0.86 | 16.61 |
| Kufri Puskar | 2.70 | 1.48 | 0.022* | 29.1 | 0.72** | -3.13 | 39.8 | 1.31* | 0.73 | 125 | 0.72** | -105 | 69 | 0.74** | -1.62 |
| Atlantic | 1.97 | 1.15** | 0.014 | 28.7 | 1.00** | -1.70 | 39.2 | 1.65* | -3.21 | 115 | 0.48 | 10 | 63 | 0.72** | -9.33 |
| Kufri Lalit | 3.06 | 0.52 | 0.013 | 31.5 | 0.79 | 4.38 | 39.8 | 0.47 | 5.82 | 143 | 0.79* | -27 | 111 | 0.00 | -2.65 |
| Kufri Bahar | 2.38 | 1.67** | 0.001 | 28.3 | 0.95** | 1.46 | 37.0 | 2.63* | -2.03 | 114 | 0.63* | -61 | 68 | 1.35** | 5.34 |
| Kufri Lalima | 3.18 | 0.59** | -0.001 | 31.5 | 1.05** | -2.79 | 42.1 | 1.02** | -1.40 | 152 | 0.44* | -87 | 109 | 0.43 | 0.48 |
| Kufri Khyati | 3.09 | 1.05** | -0.001 | 29.3 | 1.29** | -2.22 | 41.4 | 0.78 | -1.28 | 143 | 0.73 | 51 | 101 | 1.47** | 10.66 |
| Kufri chandramukhi | 2.36 | 1.53** | 0.049** | 31.9 | 1.53** | 0.65 | 39.8 | 0.32 | 1.67 | 130 | 1.73** | -4 | 90 | 2.03** | 1.21 |
| Kufri Surya | 2.49 | 1.13** | 0.005 | 30.0 | 1.32** | -2.81 | 40.2 | 1.59* | -2.31 | 126 | 1.15** | -56 | 89 | 2.75** | 0.29 |
| Kufri Jyoti | 3.09 | 0.20 | 0.004 | 31.2 | 0.92 | 5.32 | 39.7 | 0.18 | -3.17 | 148 | 0.85* | -4 | 104 | 1.04** | 5.16 |
| Population mean | 2.62 | | | 30.3 | | | 40.5 | | | 141 | | | 89 | | |

*, **Significant at 5% and 1% probability level respectively, bi= Regression coefficient, $S^2di$= Deviation from regression

30 and 60 DAP respectively. Among the tested varieties only 4 varieties at 30 DAP and 5 varieties at 60 DAP fulfilled the stability criteria at varying degree of probability levels. Processing variety Kufri Chipsona 3 registered maximum plant height values followed by Kufri Chipsona 1 at both the stages of crop growth. Apart from the processing varieties Kufri Pukhraj, Kufri Lalit and Kufri Ashok gave non-significant deviations and regression exhibiting their stability but Kufri Khyati gave regression values approaching unity.

**Leaflets per plant:** Maximum number of leaflets were exhibited by the plants grown at Nandapur location with environmental index 15.97 while Jeypore location recorded lowest environmental index (–15.62). Kufri Chipsona 3 and Kufri Bahar registered maximum and minimum values to the tune of 233 and 114 respectively. Kufri Chipsona 3 being a medium duration crop exhibited more photosynthetic efficiency with more number of leaflets. But rainfall cessation during October was a constraint for yield during off-season. Mean value for this trait over the environments was 141 which was attained with non-significant deviation and regression by five varieties only. The set of genotypes viz Kufri Lalima, Kufri Pukhraj, Kufri Lalit and Kufri Jyoti attained stability on 5 per cent while Kufri Khyati at 1 per cent probability level. Similar findings for the tested varieties are reported by Vedula (2015).

**Leaf area:** The varieties Kufri Lalima, Kufri Pukhraj and Kufri Lalit showed wider adaptability to all the four locations by registering non-significant values both in deviation as well as regression remained unaffected by harsh off-season environment. Kufri Lalit registered maximum leaf area value of 111 while minimum value of 63 was observed in exotic variety Atlantic. Nandapur location recorded maximum value of environment index of 4.07 while Jeypore location exhibited minimum value (-7.0). However Kufri Badshah showed stability parameters with low genotypic mean and is suited to unfavourable environment. Remaining varieties exhibited instability over all the locations as it showed significant deviation from regression.

**Tubers per plant:** The mean values for number of tubers/plant indicated that Kufri Ashok variety was highest yielder (7.81), while Kufri Arun was lowest yielding genotype (4.93) (Table 4). Mean value for this trait over all the environments was 6.42 per plant. As indicated by the environment index (Table 2) Nandapur location showed highest environment indices values for tubers/plant (0.22) while Jeypore location showed minimum values of environmental index (–0.36). Six varieties registered higher tubers/plant over mean value (6.42) while ten varieties deviated significantly. The genotypes Kufri Lalima, Kufri Pukhraj, Kufri Lalit, Kufri Jyoti, Kufri Ashok and Kufri Chipsona 3 showed wider

adaptability to all the 4 locations as indicated by stability criteria. Remaining genotypes with low mean values and significant deviation were unstable over the locations. Varied response of potato genotypes to different environments in case of tubers per plant was also observed by Sharma et al (2003) and Luthra et al (2005).

**Tuber dry matter:** Tuber dry matter percentage significantly varied between normal and processing varieties. Processing variety Kufri Chipsona 3 registered maximum value of 20.8 per cent followed by Kufri Chipsona 1(20.3%) while least value of 14.96 per cent was observed in Kufri Arun. The mean values over the environments (locations) was 17.18. For this character too Nandapur location registered the maximum value of environment indices (0.85) while the least value was in Jeypore conditions (-1.52). Other than the processing varieties Kufri Lalima, Kufri Lalit, Kufri Khyati and Kufri Ashok showed better adaptability to all the 4 locations for dry matter as indicated by stability parameters. Kufri Pukhraj which showed stability for other parameters recorded lower genotypic mean (16.4%). Remaining genotypes also had low mean values hence were poorly adapted to all locations. Results confirms the findings of Pandey et al (2005).

**Average tuber weight:** Kufri Pukhraj, Kufri Lalit and Kufri Jyoti with mean tuber weight of 28.94, 28.96 and 29.67 g showed stability in average tuber weight over all the locations. Kufri Pukhraj being an early variety showed early bulking. While Kufri Bahar with mean tuber weight of 22.13 g recorded minimum values. The average tuber weight over the environments was 25.44 g. Nandapur location recorded maximum value of environment index with values 2.69 while Jeypore location exhibited minimum value (-3.41). Along with above mentioned varieties Kufri Lalima and Kufri Ashok showed better adaptability to all the locations as indicated by stability parameters. Remaining varieties exhibited instability over all the locations as these showed significant deviation from regression. Similar findings are reported for potato stability evaluation by Haydar et al (2009), Davoud and Azimi (2010).

**Tuber yield:** Highest total tuber yield was exhibited by the plants grown at Nandapur location with environmental index 3.62 while Jeypore location recorded lowest environmental index (–7.02) and had less tuber yield (Table 2). Highest mean value for tuber yield was recorded for variety Kufri Lalima (133.2) while Kufri Arun (84.2) had least mean value. Mean value for this trait over all the environments was 113.3. Seven varieties were linearly predictable in terms of tuber yield because of non-significant deviation as well as regression coefficient out of which six genotypes were found stable across the four locations and Kufri Chipsona1 was unstable due to low mean. The set of genotypes viz

Table 4. Stability parameters for different characters in Kharif potato (pooled data of 2014 and 2015)

| Genotypes | Tubers/plant | | | Tuber dry matter (%) | | | Average tuber weight (g) | | | Total tuber yield (q/ha) | | | Marketable yield (q/ha) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | bi | $S^2di$ | Mean | bi | $S^2di$ | Mean | bi | $S^2di$ | Mean | bi | $S^2di$ | Mean | bi | $S^2di$ |
| Kufri Kanchan | 5.11 | 1.10** | -0.016 | 16.18 | 1.27** | 0.09 | 24.25 | 1.09** | 0.63 | 107.5 | 1.40** | -1.18 | 86.4 | 1.19* | 18.40 |
| Kufri Pukhraj | 7.66 | 0.43 | -0.020 | 16.46 | 1.05 | 0.61 | 28.94 | 0.41 | 1.06* | 127.8 | 0.51 | 2.56 | 107.4 | 0.31 | 8.96 |
| Kufri Chipsona 3 | 7.61 | 0.36 | 0.048 | 20.79 | 0.23 | 0.01 | 24.56 | 0.73** | -0.29 | 120.0 | 0.63 | -2.91 | 102.6 | 0.77* | 1.38 |
| Kufri Badshah | 5.49 | 0.73** | -0.029 | 15.97 | 1.07** | -0.07 | 25.72 | 1.81** | 0.25 | 100.5 | 0.47** | -9.16 | 79.8 | 0.95** | -6.57 |
| Kufri Arun | 4.93 | 2.22** | 0.014 | 14.96 | 0.96** | 0.15 | 22.94 | 1.41** | -0.28 | 84.2 | 1.75** | 8.05 | 69.2 | 0.85** | -7.85 |
| Kufri Ashok | 7.81 | 0.22 | -0.032 | 17.53 | 0.67 | 0.12 | 26.53 | 0.35 | 1.03* | 121.5 | 0.41 | -6.04 | 105.4 | 0.92** | -5.50 |
| Kufri Chipsona 1 | 5.73 | 1.74** | -0.034 | 20.31 | 0.89 | 0.55 | 22.41 | 0.98** | -0.36 | 102.8 | 1.25 | 39.49 | 87.3 | 1.46** | -4.67 |
| Kufri Puskar | 6.43 | 1.32** | -0.035 | 16.01 | 1.25** | 0.57 | 24.65 | 1.64** | 0.69 | 109.3 | 1.77** | 7.36 | 95.2 | 2.65** | 14.72 |
| Atlantic | 5.15 | 1.74** | -0.024 | 16.20 | 1.31** | 0.21 | 23.41 | 1.10** | -0.43 | 106.7 | 2.90** | -7.55 | 85.7 | 1.60** | -5.68 |
| Kufri Lalima | 7.75 | 0.67* | -0.011 | 18.04 | 0.52 | 0.18 | 27.48 | 0.40 | 1.53* | 133.2 | 0.23 | -8.62 | 104.1 | 0.49 | 3.11 |
| Kufri Bahar | 4.95 | 0.91** | -0.015 | 16.01 | 0.72** | -0.22 | 22.13 | 1.28** | 1.41* | 106.8 | 1.29** | 0.07 | 87.3 | 0.97 | 20.84 |
| Kufri Lalit | 7.63 | 0.70* | -0.013 | 17.64 | 0.75** | -0.32 | 28.96 | 0.28* | -0.08 | 127.3 | 0.17 | -9.74 | 104.2 | 0.43 | -1.63 |
| Kufri Khyati | 7.56 | 0.78** | -0.038 | 17.62 | 0.71 | 0.86* | 26.08 | 0.56** | 0.37 | 126.3 | 0.58** | -9.23 | 102.5 | 0.67* | 1.04 |
| Kufri Chandramukhi | 5.37 | 1.38** | -0.001 | 18.09 | 2.34** | 1.75** | 25.87 | 2.03** | -0.27 | 102.9 | 0.80** | -5.66 | 81.9 | 0.77** | -6.94 |
| Kufri Surya | 5.94 | 1.39** | -0.006 | 16.08 | 1.33** | -0.19 | 23.50 | 1.49** | 0.23 | 107.6 | 1.16** | -10.26 | 86.4 | 1.17** | -7.22 |
| Kufri Jyoti | 7.58 | 0.35 | 0.018 | 17.01 | 0.94** | -0.15 | 29.67 | 0.43 | 1.28* | 127.5 | 0.68 | 7.21 | 107.3 | 0.79* | 5.51 |
| Population mean | 6.42 | | | 17.18 | | | 25.44 | | | 113.3 | | | 93.3 | | |

*, **Significant at 5% and 1% probability level respectively, bi= Regression coefficient, $S^2di$= Deviation from regression

Kufri Lalima, Kufri Pukhraj, Kufri Lalit, Kufri Jyoti, Kufri Ashok and Kufri Chipsona 3 were found to be widely adapted to all the locations. Exotic variety Atlantic was unstable over the environments as this genotype showed significant deviation from regression. Luthra et al (2009) also reported high mean value for tuber yield in Kufri Pukhraj for early season while Kaushik et al (2006) reported similar findings in multi-location potato trials.

**Marketable yield:** Kufri Pukhraj and Kufri Jyoti had highest mean value of 107.4 and 107.3 respectively while Kufri Arun had least mean value (69.2). Mean value for this trait over all the environments was 93.3 q/ha. Nandapur location was the most favourable environment for marketable yield as indicated by high environmental index (3.14) whereas Jeypore location resulted in less marketable yield with least environmental index (–6.54). The genotypes Kufri Lalima, Kufri Pukhraj and Kufri Lalit remained non-significant at 1 per cent probability while Kufri Khyati, Kufri Jyoti, Kufri Chipsona 3 and Kufri Kanchan signicant at 5 per cent probability level. A total of six varieties had high mean values for marketable yield with non-significant regression value and non-significant deviation from regression. This signposts their adaptability to all the 4 locations for this trait. Similar results were reported by Singh et al (1999) at Modipuram, Meerut while assessing 24 potato genotypes. Kufri Bahar with lower mean yield than the population average registered stability for favourable environments. Remaining genotypes marketable yield values deviated significantly from regression hence were found unstable over all location for Kharif cultivation.

## CONCLUSION

Adaptability is the result of homoeostasis which refers to the buffering capacity of a genotype to environmental fluctuation. Genetically homogeneous populations such as pure line varieties depend heavily on individual buffering to stabilise productivity (Allard and Bradshaw 1964). General adaptability of Kufri Lalima, Kufri Pukhraj, Kufri Lalit, Kufri Khyati, Kufri Jyoti and Kufri Ashok to different locations might be ascribed to their greater individual buffering ability. Of the 16 varieties evaluated for 10 characters under study Kufri Lalit, Kufri Lalima, Kufri Pukhraj and Kufri Jyoti were found to be stable for 8, 7, 8 and 7 characters respectively. The mentioned varieties can be recommended to farmers for cultivation for off-season potato cultivation in Koraput region. However Kufri Chipsona 1 and Kufri Surya are adapted to favourable environment only due to their specific characteristics.

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