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PERFORMANCE OF POTATO VARIETIES FOR GROWTH, YIELD AND YIELD ATTRIBUTING IN SOUTH EASTERN RAJASTHAN

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KEYWORDS

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Dry matter

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Marketable and total tuber yield

ABSTRACT

Present study was conducted to evaluate the growth performance of ten (10) different potato varieties *viz.* Kufri Jyoti, Kufri Bahar, Kufri Badshah, Kufri Gaurav, Kufri Garima, Kufri Pushkar, Kufri Surya, Kufri Khyati, Kufri Pukhraj and Kufri Lauvkar under natural epiphytotic conditions of Kota, Rajasthan. Results of study revealed that maximum marketable yield and total tuber yield were recorded from K. Jyoti, K. Khyati, K. Garima and K. Bahar, while maximum tuber dry matter were recorded with K. Surya, K. Bahar, K. Jyoti, K. Pukhraj and K. Pushkar. Further, in case of vigour characteristics, maximum plant vigour and minimum disease incidence (Leaf spot and Viral) was noticed in K. Jyoti and K. Khyati. Overall it can be conclude that K. Jyoti and K. Khyati is most adaptable species under epiphytotic conditions of Rajasthan

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1 Introduction

Potato (*Solanum tuberosum* L.) popularly known as ‘The king of vegetables’. It is the third most common globally consumed crop behind rice and wheat (IPC, 2013). Potato plays a vital role in food security for ever increasing world population (Thiele et al., 2010; Scott & Sourez, 2012). In 2018, total worldwide potato cultivation area is 19.3 m.ha and total production is 388 mt. In India, total area under potato cultivation is 2.1m.ha and production is 52.59 mt in 2018 (DACFW, 2019). The major potato producing states of India are Uttar Pradesh, West Bengal, Bihar, Gujarat, Madhya Pradesh, Punjab, Haryana, Assam, Jharkhand and Chhattisgarh. In Rajasthan, total area under vegetables cultivation is 166235.8 ha and production is 1699584 MT. In Rajasthan, total area under potato cultivation is 13819 ha, production is 278519 MT and productivity is 201.6 q/ha. The major potato producing districts of Rajasthan are Dholpur, Bharatpur, Hanumangarh, Kota, Sirohi, Srigangangar and Jalore (DOHGI, 2019). Freshly harvested potatoes contain about 75-80% water, 16-20% carbohydrates, 2.5-3.2% crude protein, 0.8-1.2% minerals, 0.1-0.2% crude fats, 0.6% crude fiber and some vitamins (Yadav & Srivastava, 2015). One prior condition for high and stable yields is the choice of the most suitable potato varieties in compliance to the region’s climate and soil particularities. Beyond the high yield potential, the chosen varieties must be resistant to various environmental stresses and must have high quality potential. Potato plants are sensitive to several climatic factors, such as temperature, rainfall, humidity and photoperiod which exert a considerable influence on its growth and tuber development (Kumar et al. 2011). Good crop growth is observed when days are sunny and nights are cool (Ghosh et al., 2000). Low temperature, high light intensity and short days are conducive for early initiation of tuberization and subsequent tuber development (Das et al., 2014). Minimum of 70-90 days of favorable cool season is required to obtain an economical potato yield (Mehta et al., 2018). The optimum planting date for potatoes in Indo-Gangetic plains is the middle of October and harvesting in February/March (Kumar et al., 2007a). Climate change and its variability are posing the major challenges influencing the performance of agriculture including annual and perennial horticulture crops (Malhotra & Srivastva, 2017). Therefore, current field study was conducted at Agriculture Research Station Ummedganj, Kota, Rajasthan to evaluate the growth performance of ten available potato varieties which can yield higher, having good quality so that farmers can generate higher income.

2 Materials and Methods

Field trials was conducted with ten Indian Varieties under AICRP on Potato centre at Agricultural Research Station, Kota during 2015-2016 to 2016-2017 for finding out the yield potentiality and

diseases resistance. Selected varieties viz. Kufri Jyoti, Kufri Bahar, Kufri Badshah, Kufri Gaurav, Kufri Garima, Kufri Pushkar, Kufri Surya, Kufri Khyati, Kufri Pukhraj and Kufri Lauvkar were evaluated under natural epiphytotic conditions of Kota, Rajasthan. The varieties were planted in a randomized block design in the first week of November of every year, the planting condition were 60x20 spacing in 3x2.4 meter plots (60 plants/plot), each treatment replicated three times. The recommended dosage of NPK187.5:125:125 kg/ha was incorporated and 50 per cent of nitrogen applied at sowing and remaining 50 per cent of nitrogen after 30 days of sowing at earthing-up operation (Sharifi et al., 2007). The package of practices of AICRP on Potato, ARS, Kota was followed during different stages of crop growth and harvesting was done at 90 days after sowing.

2.2 Vegetative growth attributes

The observations related to vegetative growth attributes, yield attributes and disease scoring were recorded as suggested by Bhuneshwari et al. (2013).

2.2.1 Plant Emergence

Plant emergence (%) at 30 days after sowing was calculated as given below

$$\text{Plant emergence (\%)} = \frac{\text{Total number of tubers germinated}}{\text{Total number of tubers sown}} \times 100$$

2.2.2 Plant vigour

The plant vigour was measured on the visual observation in (1-5 scale) at 60 DAP (Amarananjundeswara et al., 2018).

2.3 Yield attributes

2.3.1 Marketable tuber yield (t/ha)

Out of total tubers obtained from plants, the tubers were sorted and excluding small tubers all other grades were considered as marketable and weight was recorded and this data were used for estimate marketable tuber yield per ha.

2.3.2 Total tuber yield (t/ha)

Total tuber yield was calculated by using following formula

$$\text{Total tuber yield (t/ha)} = \text{Marketable tuber yield (t/ha)} + \text{small tuber yield (<20 g)}$$

2.3.3 Rottage (t/ha)

Weight of rotten tubers were recorded and by using this data for rottage per hectare (tonnes) was calculated

Table 1 Performance of various varieties on various growth attributes and tuber yields characteristics (Pooled Data)

Hybrid/ Variety	Mean emergence at 30DAP (%)	Plant vigour at 60DAP (at 1-5 Scale)	Tuber rottage at harvest (t/ha)	Foliage senescence at dehauling (%)	Tuber yield (t/ha)		Tuber dry matter (%)
					Marketable yield>20g. size	Total yield	
K. Jyoti	94.62	4.67	2.56	85.00	19.96	22.33	21.33
K. Bahar	91.89	4.00	2.15	89.00	17.33	19.55	22.13
K.Badshah	88.70	4.00	1.85	90.00	13.37	15.56	19.00
K. Gaurav	91.59	4.17	1.78	90.00	13.70	15.78	19.40
K.Garima	94.63	4.33	2.29	83.33	18.22	20.18	19.50
K.Pushkar	93.41	4.17	2.44	88.33	16.55	18.88	20.30
K. Surya	92.00	4.00	2.18	90.00	13.89	16.00	22.43
K. Khyati	94.22	4.67	2.30	85.00	18.96	21.07	20.57
K. Pukhraj	94.07	4.33	2.04	86.67	15.11	17.03	20.60
K. Lauvkar	89.00	4.00	2.29	90.67	13.07	15.45	19.93
F-Test	SIG	SIG	SIG	SIG	SIG	SIG	SIG
CD 5%	2.94	0.40	0.36	4.06	1.18	1.20	1.06
SE	1.39	0.19	0.17	1.92	0.56	0.57	0.50
CV %	1.84	5.55	9.58	2.68	4.27	3.83	2.98

2.3.4 Disease scoring

Per cent Leaf spot and viral diseases were observed and calculated by using the following formula scale.

$$\text{Virus disease incidence (\%)} = \frac{\text{No. of Infected Plants}}{\text{Total No. of Plants}} \times 100$$

$$\text{Leaf spot disease Intensity (\%)} = \left(\frac{\text{Sum of Individual Ratings}}{\text{Total No. of Plants}} \right) \times \left(\frac{100}{\text{Max. Scale}} \right)$$

3 Results and Discussion

The observations on percentage of plant emergence, plant vigour, marketable tuber yield, total tuber yield and tuber rottage were recorded for two consecutive years. All shown varieties have significant difference in their growth performance, yield potentiality and disease tolerance capability. Maximum marketable yield and total tuber yield were recorded from K. Jyoti, K. Khyati, K. Garima and K. Bahar, while maximum tuber dry matter were recorded with K. Surya, K. Bahar, K. Jyoti, K. Pukhraj and K. Pushkar. However, K. Badshah, K. Gaurav and K. Lauvkar were found inferior as compare to other tested varieties. The growth parameters indicated that, all the tested varieties have higher percentage of plant emergence i.e. ranged from 88 to 95% at 30 days after sowing (Table 1). Maximum plant vigour at 60 days after planting was noticed in K. Jyoti and K. Khyati. Further,

the minimum disease intensity of leaf spot and viral disease was recorded in K. Jyoti and K.Khyati (Table 2). The better performance of these varieties might be due to its genetic make-up and its better adoptability to prevailing environmental conditions (Gobana, 2002). These results are in agreement with other researchers who investigated that marketable tuber yield was significantly varied with variety, location and genotypes and genotype X environment interaction (Pandey et al., 2004; Kumar et al., 2007b; Elfinesh, 2008; Gebreselassie et al., 2016; Mehta et al., 2018).

Table 2 Disease incidence at 90-105 days of sowing

Hybrid/ Variety	Late blight (%)	Leaf spot diseases (%)	Viral diseases (%)
K. Jyoti	0	11.50	9.00
K. Bahar	0	34.50	27.50
K.Badshah	0	39.00	21.50
K. Gaurav	0	24.00	15.00
K.Garima	0	24.50	13.00
K.Pushkar	0	15.50	15.50
K. Surya	0	20.00	18.00
K. Khyati	0	12.50	12.50
K. Pukhraj	0	35.50	13.00
K. Lauvkar	0	34.00	17.00

Conclusion

Among the tested varieties, variety K. Jyoti, K. Khyati, K. Garima and K. Bahar were the best varieties while K. Surya, K. Pukhraj, K. Pushkar and K. Gaurav were found next in terms of total and marketable tuber production under Kota, Rajasthan climatic conditions. However, maximum tuber dry matter was recorded from K. Surya, K. Bahar, K. Jyoti and K. Khyati while the minimum disease intensity of leaf spot and viral disease was recorded in K. Jyoti and K. Khyati.

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Conflict of Interest

Authors would hereby like to declare that there is no conflict of interests that could possibly arise.

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