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Research Article

Participatory Selection of Elite Clones and Varieties of Potato with Preferential Characteristics for Faster Adoption

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ABSTRACT

Collaborative studies were conducted at Karnal, Kurukshetra, Rohtak, Sirsa and Mahendergarh in Haryana during 2018-19 to identify suitable varieties for semi-arid, agro-ecology of Haryana. The experiments with 7 most promising clones from International Potato Centre (CP-4388 7003, CP-4393 7008, CP-4395 7010, CP-4397 7011, CP-4404 7015, CP-4406 7017, CP-4197 7019) along with five varieties from Central Potato Research Institute (Kufri Pukhraj, Kufri Khayti, Kufri Mohan, Kufri Chipsona 1, Kufri Lima) were conducted. The experiments were laid out in randomized block design with three replications at each location. Sowing was done in October, 2018 at Karnal, Kurukshetra and Rohtak, and in November, 2018 at Mahendergarh and Sirsa. The exercise for Participatory Variety Selection (PVS) of potato clones/ varieties was conducted at the vegetative stage of potato crop in November and December of 2018 in Karnal, Kurukshetra, Rohtak and Mahendergarh, and in January 2019 at Sirsa. In this exercise, listing and ranking of morphological criteria and ranking of clones/ varieties was done by stakeholders.

As per the global score, the top three criteria preferred by the participants were, thick and erect leaves with more stem numbers, frost resistance, and resistance to pests and diseases. Ranked on the basis of the preferred criteria, the clones/varieties liked by the stakeholders were Kufri Lima, CP-4395 (7003), CP-4406 (7017). Based on vegetative growth of plants, Kufri Lima was ranked at number 1, while CP-4406 (7017) was ranked at number 2, Kufri Mohan and CP-4395 (7003) ranked at number 3. PSV exercise offered the farmers an opportunity to select preferred clones/ varieties which could lead to their faster adoption, thus could enhance their income by quick adoption of new high yielding, short duration and disease resistant varieties.

Keywords: *Potato, Clones, Varieties, Participatory Varietal Selection, PVS, Ranking*

INTRODUCTION

Potato is an important food crop grown all over the world. In India, it is grown on an area of 2.14 million ha with 51.3 million tons production of (IASRI, 2019). India is second only to China in potato cultivation.

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It is a suitable crop for fitting in with different cropping systems without putting extra pressure on scarce land and water resources due to flexibility in its sowing and harvesting because of its early maturity character. By 2050, there is need to increase the production of potato up to 122 million tons with productivity of 35 tons per hectare to feed the increasing population of the country (CPRI, 2015). To meet this production target, there is need for climate smart clones/ varieties with higher production.

Some of the good clones are available with short duration, disease resistance, high yielding and heat tolerance characteristics; however, their adoption and marketability will depend on their acceptability by the farmers/ stakeholders. The biggest reason for non-adoption of some of such varieties is that they are not exposed to the performance of these varieties. Adoption of new varieties could be facilitated and enhanced by involving the farmers/ stakeholders in selection process. Participatory variety selection (PVS) is a novel approach for selection of promising clones and varieties which also helps in creating demand before the release of the variety through their exposure during selection of the clones/ varieties during selection. Hence, studies were undertaken at Potato Technology Centre, Shamgarh, Karnal, India in collaboration with International Potato Centre (CIP) and Central Potato Research Institute (CPRI) to identify suitable clones for semi-arid agro-ecology of Haryana through PVS by farmers. Genetic resources exchanged from CIP and new varieties from CPRI were evaluated for this study.

However, the promising clones should also meet regional requirements and preferences of potato growers and consumers. Hence, the approach of participatory varietal selection (PVS) is increasingly being adopted by researchers. This process facilitates selection of most suitable clones liked by stakeholders as per their needs (Semagn et al., 2015). Main purpose of introducing PVS for potato crop is to cut short the cycle of release of desirable varieties and enhance their adoption rate. In the existing system, it takes 10-12 years to release a new variety and in several cases, the adoption rate is poor due to limited involvement of farmers. PVS helps to know the preferences of stakeholder which determines the adoption after varietal release. PVS has become popular in some of the countries for various crops and in India also main emphasis is on evaluating the new clones for their yield, appearance, texture and taste based on organoleptic tests (Gupta et al., 2015). This study will help to identify good clones and accelerate the adoption of potato clones/ varieties in Haryana state of north-western India.

MATERIALS AND METHODS

Experiments were conducted in five districts of Haryana (Karnal, Kurukshetra, Sirsa, Mahendergarh and Rohtak) for Participatory Varietal Selection (PVS) of elite clones/ varieties in farmer participatory mode for selection of climate smart varieties with acceptable characteristics. Clones from CIP (International Potato Centre) were evaluated using PVS technique for selection at vegetative stage during 2018-19. Seven CIP elite clones were planted in the Mother and Baby trials, with Kufri Lima, Kufri Pukhraj, Kufri Mohan, Kufri Chipsona-1 and Kufri Khyati as the standard checks. The main objectives of the trials were to assess the field performance of the clones and to conduct a PVS exercise during different stages of the crop cultivation. Through the PVS exercise, information on farmers' preferences for new varieties and their assessment of the clones was recorded at 50 to 60 days of planting, when the potato crop reached its full blooming vegetative stage. Thereafter PVS was done with the farmers and other stakeholders of the potato production chain, who were invited to the mother trial fields for their observations and opinion about the clones and varieties.

The exercise for PVS was conducted at the vegetative stage of potato crop in November and December of 2018 in Karnal, Kurukshetra, Rohtak and Mahendergarh, and in January 2019 at Sirsa. The participants

were informed about various exercises during the PVS. Basic rules of evaluation were explained to all persons (Paris et al., 2011).

Listing and ranking of morphological criteria

The participants were informed about the different CIP clones and many high yielding, pest resistant varieties of CPRI. The stakeholders were informed how the different genetic material had differences in tuber shapes, size and colour, and other vegetative characteristics, biotic and abiotic stress, and nutrient content. They were informed how to list and rank preferred vegetative criteria for the PVS. At the vegetative stage, morphologies like plant height, stem density, leaf type, pests & diseases tolerance were assessed. Opinion of the participants were taken for preferred variety of potato. Each of these criteria were written on the board or straight to paper as the farmers answered about the preferred characteristics. These listed criteria were ranked as per the participants' choice.

Each of the above criteria was written on a paper and kept on the table in front of a container (the container used as the ballet box). The participants ranked the criteria by casting a vote for the three most important criteria based on their preferences. Participants were given 6 Rajma seeds to men and 6 Chana seed to women to cast their vote, 3 seeds for the first most important criterion, 2 seeds for the second, and 1 seed for the third important criterion as per the participants' choice. It was ensured that vote was an individual choice.

Ranking of clones

After the ranking of criteria, participants were taken to the field to observe the different clones of potato to choose the best three clones and rank them by casting votes. The containers were kept in front of each clone/variety for the participants to cast their votes. Then, each participant was given 6 seeds (kidney beans for men and gram seeds for women), to cast their votes using 3 seeds for 1st best clone, 2 seeds for 2nd best clone and 1 seed for the 3rd best clone. The results of the votes and ranks given by the participants were discussed.

RESULTS AND DISCUSSION

Listing and ranking of morphological criteria

As per the global score, the top three criteria preferred by the participants were: thick and erect with more stem numbers, frost resistance, and resistance to pests and diseases (Table 1). Quality seeds, broad & thick leaves, and high yield were ranked at number 1 in Karnal, Sirsa and Kurukshetra, respectiviely. Frost was a major concern in Mahendergarh and Sirsa.

Ranking of clones

In the mother trial held at Karnal, the stakeholder's preference was for Kufri Lima, CP-4395 (7010), and CP-4393 (7008). In the mother trial held at Mahendergarh, the stakeholder's preference was for CP-4406 (7017), Kufri Pukhraj and Kufri Mohan. In the Baby Trial held at Sirsa, the stakeholders' preference was for CP-4395 (7003), CP-4395 (7010) and Kufri Lima. In mother trial at Sirsa, the stakeholders preference was CP-4406 (7017), Kufri Lima and Kufri Mohan. In mother trial held at Kurukshetra, the stakeholders' preference was for Kufri Lima, CP-4404 (7015) and CP-4388 (7003)/ CP-4406 (7017).

Ranked on the basis of the preferred criteria, the clone/variety liked by the stakeholder was Kufri Lima, CP-4395 (7003), CP-4406 (7017). Based on vegetative growth of plants, Kufri Lima was ranked at number 1, while CP-4406 (7017) was ranked at number 2, Kufri Mohan and CP-4395 (7003) ranked at number 3. Farmer's decision making depended on their socio-economic conditions and they paid sincere attention to very specific genotypic characters like overall marketable proportion in total yield, appearance, colour of tuber skin and flesh etc., which was of utmost importance to the researchers (Semagn et al., 2015). Participatory varietal selection of clones resulted in overall acceptance of the promising clones by the farmers (Arya et al., 2017).

It has been observed that farmers have been approaching Potato Technology Centre (PTC) frequently from far off places in search of getting seeds of new varieties of potato particularly Kufri Lima. Farmers asking and searching for new varieties for their field, was a rare phenomenon not witnessed often in past. Mahendergarh which is traditionally a non-potato growing area, the soil and climatic conditions are very suitable for processing varieties as well as for seed production. In Mahendergarh, the tuber size of all the clones and varieties was found to be very small, due to virgin soil with low nutrition and mineral content in these sandy soils. However, the size of tuber was quite small with large number of tubers per plant, but the quality of tubers was excellent in terms of uniformity in shape and skin colour, which made tubers look very attractive. This situation could be utilized in favor of growing seed crop.

This exercise of PSV offered the farmers an opportunity to select preferred clones/ varieties which could lead to their faster adoption, thus could enhance their income by quick adoption of new high yielding, short duration and disease resistant varieties.

Table 1: List and ranking of preferred morphological criteria at vegetative stage of potato

Districts		PTC, Shamgarh, Karnal		IDTC, Sunaria farm, Mahendergarh		Baby Trial, Basuda, Sirsa		Mangiana farm, Sirsa		Kharindwa farm, Kurukshetra	
S. No.	Criteria	Global Score	Rank	Global Score	Rank	Global Score	Rank	Global Score	Rank	Global Score	Rank
1	Medium plant height	7	V	15	IV	9	V	0	-	12	IV
2	Open and spread Canopy	7	V	0	-	0	-	0	-	0	-
3	Thick and erect with more stem numbers	33	III	20	III	19	II	15	III	10	V
4	Frost tolerant	15	IV	47	II	12	IV	20	II	3	VII
5	Quality seed with more eyes	75	I	0	-	0	-	0	-	3	VII
6	Broad thick leaves	7	V	11	V	28	I	0	-	6	VI
7	high yield	0	-	0	-	0	-	0	-	30	I
8	Short Duration	0	-	0	-	0	-	0	-	18	III
9	Resistant to pest and diseases	49	II	50	I	14	III	49	I	26	II

Table 2: Ranking of the clones and varieties by the stakeholder in Mother (MT) and Baby Trials (BT)

S. No.	Ranking of clones in the field	PTC, Shamgarh, Karnal, (MT)		IHDC, Sundhra farm, MG (MT)		Basuda farm, Sirsa (BT)		Mangiana farm, Sirsa (MT)		Kharindwa farm, KKS, (MT)	
		Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
1	CP-4388 (7003)	1	X	17	V	15	I	12	IV	10	III
2	CP-4393 (7008)	42	III	9	VII	6	IV	6	V	6	IV
3	CP-4395 (7010)	52	II	17	V	14	II	6	V	0	-
4	CP-4397 (7011)	18	VII	16	VI	0	-	6	V	0	-
5	CP-4404 (7015)	24	VI	18	IV	0	-	5	VI	19	II
7	CP-4406 (7017)	3	IX	34	I	0	-	30	I	10	III
8	CP-4197 (7019)	6	VIII	0	-	0	-	2	VIII	6	IV
9	Kufri Pukhraj	26	V	25	II	0	-	0	-	4	V
10	Kufri Khayti	6	VIII	0	-	3	V	0	-	0	-
12	Kufri Mohan	39	IV	22	III	6	IV	15	III	6	IV
13	Kufri Chipsona 1	3	IX	17	V	2	VI	3	VII	1	VI
14	Kufri Lima	56	I	0	-	10	III	20	II	47	I

REFERENCES

Arya, S., Rawal, S., Luthra, S.K., Sharma, S.K., Sharma, N., Gupta, V.K., & Kadian, M.S. (2017). Participatory evaluation of advanced potato (*Solanum tuberosum*) clones for water stress tolerance. *Indian J. Agric. Sci.*, *87*(11), 1559–64.

CPRI. (2015). Vision 2050. ICAR-CPRI, Shimla. P 33.

IASRI. (2019). Agricultural Research Data Book 2019. ICAR-IASRI, New Delhi. pp 161.

Paris, T.R., Manzanilla, D., Tatlonghari, G., Labios, R., Cueno, A. and Villanueva, D. (2011). Guide to participatory varietal selection for submergence tolerant rice. International Rice Research Institute, Los Banos, Philippines and the Ministry of Foreign Affairs, Japan, P 111.

Semagn, A.K., Donald, H., Keith, P., Walter, D.J., Fentahun, M.T., & David, W. (2015). Identification of farmer priorities in potato production through participatory variety selection. *American J. Potato Res., 92*, 648-661.