

STUDY OF QUALITY OF POTATO VARIETIES IN TROPICAL REGION

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Abstract: Potato crop is basically grown under temperate climatic conditions. The crop grows best in cool and frost free areas where the tuber development is favoured at 20^o C. The experiment entitled “**Studies on the quality of potato (*Solanum tuberosum* L.) varieties under Southern Telangana Agroclimatic conditions**” was carried out with an aim to know their starch content, storage under ambient conditions and cooking quality under Southern Telangana Agroclimatic conditions (Tropical zone) at Research Farm, College of Horticulture, Hyderabad, Sri Konda Laxman Telangana State Horticultural University during the Rabi season of 2020-2021. The experiment was laid out in a Randomized Block Design consisted of six promising potato varieties *viz.*, Kufri Chipsona-1, Kufri Chipsona-3, Kufri Jyoti, Kufri Chandramukhi, Kufri Lauvkar and Kufri Pukhraj procured from Central Potato Research Institute, Gwalior with four replications.

Results indicated that there was a significant variation in quality parameters among the varieties. Variety ‘Kufri Chipsona-3’ recorded highest starch content (27.36%). Maximum storage life under ambient conditions (71.45 days) were recorded in ‘Kufri Pukhraj’. ‘Kufri Chandramukhi’ was preferred for external appearance by consumers for characteristics such as size, shape, skin, texture. As regards colour, crispiness, texture and taste of fried potato varieties ‘Kufri Chipsona-3’ was preferred. The performance of all the varieties in terms of chipping quality was in the order of Kufri Chipsona-3 > Kufri Chipsona-1 > Kufri Chandramukhi > Kufri Jyoti > Kufri Lauvkar > Kufri Pukhraj. Kufri Chipsona-1 and Kufri Chipsona-3 are best for processing purposes. The flavour and texture of boiled potatoes, Kufri Pukhraj and Kufri Chandramukhi stand out. Finally, it is concluded that varietal and environmental variations as well as their interaction had a considerable influence on quality of potato varieties.

Keywords: Potato, Tropics, Telangana, Quality, Starch, Storage.

INTRODUCTION

Potato (*Solanum tuberosum* L.) is an annual plant in the nightshade family (*Solanaceae*) and is native to the Peruvian-Bolivian Andes. This is a world food crop having a significant contribution towards food and nutritional security, especially in the developing world. It is considered as a balanced food due to the presence of high-quality proteins, vitamins and minerals, trace elements with lesser energy (Yadav *et al.*, 1994). It produces more quantity of dry matter, edible

energy and edible protein within short period of time than cereals like rice and wheat which makes it nutritionally superior vegetable as well as staple food in our country and also throughout the world.

Hence, potato has potential to achieve the nutritional security of the nation. Average 100 g fresh tuber contains substantial quantity of energy with 2.8g edible protein, 16.3 g starch, 0.6 g total sugar, 0.5 g crude fibre, 22.6 g of carbohydrate and vitamin-C at the rate of 25 mg

(Bhuwneshwari *et al.*, 2013). Potato also contains considerable quantities of niacin, thiamine, pyridoxine and its derivatives (Yadav *et al.*, 2015).

The potato is a nutritionally valuable staple food. It is used for fresh consumption, processing into French fries and chips (crisps), as well as for the production of dry products and starch extraction. Potato is integral part of food and traditional cousins and likely to find more importance in the dietary habit of Indian people. Potato is a semi-perishable crop but can be stored for over 6 months at 3–4 °C in cold store. Storage is necessary for a regular supply of potatoes to the consumers during offseason. In India 90 % of the potatoes are grown in sub-tropical plains during winter crop season. Cooking quality evaluation also permits the best utilization of each cultivar according to different uses (chips, French fries, dehydrated products, fresh consumption etc.,)

MATERIAL AND METHODS

A field experiment was laid at PG Research block, Department of Vegetable Science, College of Horticulture, Rajendranagar, Sri Konda Laxman Telangana State Horticultural University during *Rabi*, 2020-2021. Geographically, it is situated at a latitude of 17^o.19' N, longitude of 79^o.23' E and altitude of 542.3 m above mean sea level. It has semi-arid tropical zone with average rainfall of 615.6 mm. The soil is sandy loam in texture. Six elite varieties Kufri Chipsona-1, Kufri Chipsona-3, Kufri Jyoti, Kufri Chandramukhi, Kufri Lauvkar and Kufri Pukhraj were procured from ICAR- CPRS, Gwalior, Madhya Pradesh. The experiment was laid in randomized block design with four replications. Healthy, uniform sized tubers were planted at a spacing of 60x30 cm during first week of November, 2021 and the crop was harvested during last week of January, 2021.

Tubers from five plants were collected for destructive sample to estimate starch percentage and to evaluate cooking quality.

Estimation of Starch

The total starch content was estimated by the anthrone reagent. In hot acidic medium starch is hydrolyzed to glucose and dehydrated to

hydroxymethyl furfural. This compound forms a green coloured product with anthrone.

0.1 to 0.5 g of the sample was homogenized in hot 80 per cent Ethanol to remove sugars. It was then centrifuged and the residue was retained. The residue was washed repeatedly with hot 80 per cent Ethanol till the washings do not give colour with Anthrone reagent. Residue was dried over a water bath. 5.0 ml of water and 6.5 ml of 52 per cent Perchloric acid was added to the residue for extraction in at 0 °C for 20 minutes, after centrifuge and supernatant was saved.

Extraction was repeated using fresh Perchloric acid. Supernatant liquids were pooled and the volume was made up to 100 ml. From this, dilution was made in the ratio 1:5 using distilled water. 0.1 and 0.2 ml of this diluted supernatant was pipette in to test tubes and volume was made up to 1 ml with distilled water. 4ml of anthrone reagent was added to each test tube and heated for about 8 minutes in boiling water bath. It was rapidly cooled and intensity of green dark green was read in UV visible spectrophotometer (Thermo Spectronic, USA, model Genesys 10) at 630 nm.

A series of standards using working glucose standard (100 µg ml⁻¹) 0 µg to 500 µg were run and standard curve was plotted. The glucose content in the sample was estimated using the standard graph, and then the value is multiplied by a factor 9 to arrive the starch content (Sadasivam and Manickam, 1992).

Storage life at ambient conditions (days)

Potatoes from each samples were stored separately at the room temperature or ambient conditions (minimum 15^o C to maximum 30^o C) by spreading on the dry floor.

Cooking quality

Sensory evaluation

The test chosen for assessing the degree of satisfaction was a verbal hedonic scale. A value along a scale of nine points was assigned to each hedonic description (Hedonic scale ranged from 1 to 9. 1=Dislike extremely, 2=Dislike very much, 3=Dislike moderately, 4=Dislike slightly,

5=Neither like nor dislike, 6=Like slightly, 7=Like moderately. 8=Like very much, 9=Like extremely). Each parameter was analyzed separately from the others and no more than five samples were tested. The only prerequisite was the person chosen should be a usual consumer of potatoes.

Preparation of Chips

Chips were prepared 15 days after harvest of potato tuber. During this 15 days period, the potato was stored in an ambient environment. Randomly selected 10 potato tubers from each replication were washed and peeled before slicing. The average thickness of slices were spread in paper towel to remove surface water and then fried immediately in refined sunflower

oil at 180°C. The ratio of the frying oil and potato slices were maintained at 20:1. The chips (25g) were packed in a High Density Poly Ethylene pouch of 8 guaze thickness. The chips were stored at the ambient environment.

Boiled potatoes

For sensory evaluation of the boiled potatoes, they were washed and cooked without peeling, in pressure cooker with boiling water for 35 minutes.

RESULTS AND DISCUSSION

Starch content (%)

Kufri Chipsona-3 recorded highest starch content (27.36 %) which was statistically at par with Kufri Chipsona-1 (25.83 %) and the minimum starch content reported in Kufri Pukhraj (16.48%).

The highest starch content might be due to higher dry matter content in these cultivars, as starch content and dry matter contents of potatoes are directly related to each other. The increased specific gravity after harvest at ambient conditions could be due to difference in starch physico-chemical and functional characteristics of cultivars (Pinhero *et al.*, 2009). They reported slight increase in amylase content during storage, which had direct relation to specific gravity. Greater percentage of larger starch granules was found to be associated with specific gravity and mealiness of potato. Kaur *et al.* (2017) estimated the higher starch content of 18.50 in cultivar Kufri Chipsona-1 and 18.10% in Kufri Chandramukhi, and both of them were statistically at par with each other. Kaure *et al.* (2014) reported maximum in Kufri Chipsona-1.

Effect of varieties on storage life under ambient conditions (days)

Kufri Pukhraj recorded maximum storage life under ambient conditions (71.45 days) which was statistically at par with Kufri Chandramukhi (70.65 days) and the minimum storage life recorded in Kufri Chipsona-1 (47.35 days).

The maximum storage life of upto 71 days noted for Kufri Pukhraj with minimum sprouting and physiological weight loss. This might be due to various factors such as physiological condition



Kufri Chipsona-1



Kufri Chipsona-3



Kufri Jyoti



Kufri Chandramukhi



Kufri Lauvkar



Kufri Pukhraj

Chips of different potato varieties

of potatoes during harvest, harvest time, cultivar, storage time, temperature and relative humidity. After harvesting, various changes such as respiration, transpiration, sprouting, rise in temperature, diseases or pest occur in potato (Gupta *et al.*, 2015). Different cultivars of potato possess different properties as per their genomic constitution and thus have variable shelf life.

Cooking quality

Sensory evaluation of Potato varieties

Kufri Chandramukhi was preferred for external appearance by panel of consumers and judges which means they appreciated characteristics such as size, shape, skin, texture and Kufri Chipsona-1 was the least preferred. As regards colour, crispiness, texture and taste of fried potato varieties Kufri Chipsona-3 was preferred and Kufri Pukhraj was least preferred. As regards flavour and texture of boiled potatoes,

Kufri Pukhraj and Kufri Chandramukhi stand out, while Kufri Chipsona-3 was rated lowest.

The different rates observed depending on whether the potatoes were fried or boiled suggests that the use of each variety should be oriented to one or the other types of cooking (Lorenzo and Lorenzo, 1989).

Table 1: Starch content (%) and Storage at ambient conditions (days) of different potato varieties.

Variety/Treatments	Starch content (%)	Storage life at ambient conditions (days)
Kufri Chipsona-1	25.83 ^{ab}	47.35 ^{ef}
Kufri Chipsona-3	27.36 ^a	54.2 ^d
Kufri Jyoti	23.04 ^{bcd}	66.5 ^c
Kufri Chandramukhi	24.38 ^{abc}	70.65 ^{ab}
Kufri Lauvkar	18.25 ^e	50.9 ^{de}
Kufri Pukhraj	16.48 ^{ef}	71.45 ^a
Sem (±)	1.07	1.18
CD(0.05)	3.23	3.55

Table 2: Mean values of the Sensory parameters of the varieties tested

Variety	Raw potato	Fried Potato Chips						Boiled potato	
	External appearance	Appearance	Colour	Crispiness	Texture	Taste	Over all acceptability	Flavour	Texture
Kufri Chipsona -1	5.5	7.3	7.4	6.3	5.2	7.2	7.5	6.5	5.4
Kufri Chipsona-3	7.2	8.2	8.5	8.8	7.4	9.3	9.3	6.3	5.3
Kufri Jyoti	6.4	6.3	5.2	4.3	3.3	6.3	6.2	8.2	7.2
Kufri Chandramukhi	8.5	6.9	7.7	7.4	6.7	6.2	7.2	9.3	8.2
Kufri Lauvkar	6.3	5.5	5.3	4.3	4.5	5.1	5.4	7.4	7.1
Kufri Pukhraj	7.4	4.4	4.4	3.5	3.2	5.4	4.6	8.5	8.2

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