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Pragya Sharma

Research Scholar, Department of Vegetable Science, Pt. KLS College of Horticulture and Research Station, Rajnandgaon, Chhattisgarh, India

Jitendra Singh

Professor, Department of Vegetable Science & Dean, Pt. KLS College of Horticulture & Research Station, Rajnandgaon, Chhattisgarh, India

Versha Kumari

Guest Faculty, Department of Vegetable Science, Pt. KLS College of Horticulture & Research Station, Rajnandgaon, Chhattisgarh, India

Rekha Singh

Assistant professor in home science, college of horticulture & research station, Sankara, Patan, Durg, Chhattisgarh, India

Corresponding Author:

Pragya Sharma

Research Scholar, Department of Vegetable Science, Pt. KLS College of Horticulture and Research Station, Rajnandgaon, Chhattisgarh, India

Evaluation of turmeric varieties for post-harvest and quality traits under Chhattisgarh plains

Pragya Sharma, Jitendra Singh, Versha Kumari and Rekha Singh

Abstract

The present experiment was carried out at Pt. KLS College of Horticulture and Research Station, Rajnandgaon under Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). Under this experiment four treatments / varieties viz; C.G. Haldi-1, Suranjana, IISR Pragati and PDKV Waigaon. The result revealed that yield parameters like fresh weight of mother rhizome (59.28gm) and finger rhizome (228.53gm) per plant, total fresh weight (287.82gm) per plant, number of primary rhizome (7.15) per plant, diameter of mother rhizome (4.50cm) and finger rhizome (2.44cm), dry weight of mother rhizome (16.22gm) and finger rhizome (50.53 gm) per plant, dry matter % of mother rhizome (30.05%) and finger rhizome (32.37%) per plant and recovery % of sundried turmeric (27.21%) and boiled turmeric (25.39%) was recorded maximum for treatment T2 (Suranjana). In case of length shrinkage of sundried turmeric (32.32%) and boiled turmeric (44.55%) recorded minimum value indicating positive characteristic for yield parameters. For quality parameters, curcumin percentage of sundried turmeric powder (6.2%) and curcumin percentage of boiled dried turmeric powder (5.8%) were recorded highest in treatment T4 (PDKV Waigaon) followed by treatment T2 (Suranjana). In case of organoleptic evaluation of sundried turmeric powder and boiled dried turmeric powder with different parameters such as colour, aroma and taste treatment T4 (PDKV Waigaon) showed best performance followed by treatment T2 (Suranjana). Thus, on the basis of overall performance treatment T2 (Suranjana) is found suitable for cultivation and culinary purpose.

Keywords: turmeric, post-harvest and quality traits and Curcuminoids

Introduction

Turmeric (*Curcuma longa*. L) commonly known as 'Haladi' is native to Southern tropical Asia and belongs to family Zingiberaceae. Turmeric is a versatile plant with innumerable uses as spice, condiments, cosmetic, medicine and many religion ceremonies throughout the India. Turmeric is one of the valuable spice crop in India and plays a vital role in national economy. The major turmeric producing state in India are Telangana, Karnataka, Tamil Nadu, Andhra Pradesh and West Bengal. Curcumin occurs naturally in the rhizome of turmeric. Turmeric contains curcumin, along with other chemical constituent known as the 'Curcuminoids' which is major the main phytoconstitutes and found approximately 1-6% in turmeric and is responsible for yellow-orange colour in turmeric (Niranjan *et al.* 2013) [7]. The major curcuminoids present in turmeric are demethoxycurcumin and bisdemethoxycurcumin. The curcuminoid complex is also referred to as Indian saffron, yellow root, yellow ginger, Kacha haldi, ukon or natural yellow. Turmeric has got a wide range of activities, properties and uses as per the ancient traditional medicinal text, some of which are stimulant, tonic, carminative, antiseptic. Curcumin reduces intestinal gas formation, have high anti-inflammatory activities, anti-bacterial, ant amoebic and antiHIV activities. Curcumin also shows antioxidant activity. It also shows anti-tumour and anti-carcinogenic activity. It is effective in treating liver obstruction and dropsy, is externally used for ulcer and inflammatory troubles in joints, small pox, chicken pox, conjunctivitis, relieves pain in scorpion sting, and is used in treatment of urinary disease, disease of blood, diarrhea, bronchitis, vertigo and gonorrhoea (Nadkarni 1976; Kritkar *et al.* 1984) [6, 4].

Post-harvest of turmeric plays an important role on final yield and quality of turmeric. As harvested turmeric have 80-90% moisture and other parts that must be removed. Processing is most crucial process of harvested turmeric rhizome for seed and commercial produce. The post-harvest processing of turmeric consists of washing, cleaning, curing, drying, polishing, size reduction and packaging (Weiss, 2002) [11]. The duration of boiling of turmeric rhizome greatly affect the colour, aroma and taste of turmeric powder.

Drying of turmeric is one of the important post-harvest step, which preserve turmeric and prevent spoilage and deterioration of turmeric rhizome as it is not accepted by the processing industry and exporters. Turmeric rhizome can be dried directly in sun or it can be dried after boiling of rhizome until soft. Both of this method is used by large number of farmers but have its advantages and limitations. Therefore, research has to be conducted to know which method takes minimum time to dry without affecting, the quality parameters such as colour, aroma, taste and quality of turmeric.

There is no other oriental plant that has such a diversity of usage all over the world. Though wide genetic variability exists in this crop with regards to the yield and yield attributes, however not much work has been done on selection of superior types with high yield in Chhattisgarh. Most of the turmeric growers are growing local varieties which are low yielding. Thus, main objective of this study was evaluation of turmeric varieties for post-harvest and quality traits under C.G. plains.

2. Material and Method

The experiment was conducted in the Laboratory of Department of Vegetable Science at Pt. KLS College of Horticulture and Research Station, Rajnandgaon under Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during summer season of 2022 in order to evaluate turmeric varieties for post-harvest quality traits under C.G. plains. The experiment was conducted in ANOVA (CRD) with four treatments/ varieties (C.G. Haldi-1, Suranjana, IISR Pragati and PDKV Waigaon) and four replications. Randomly five plants of turmeric selected from each replication. The data recorded on yield aspects were statically analysed by the method suggested by Panse and Sukhtame (1995) [12]. The estimation of curcumin percentage of turmeric powder (boiled and sundried) was carried out by solvent extraction and spectrophotometric measurement method (Geetanjali *et al.* 2016) [3]. The organoleptic evaluation of turmeric powder was done by using turmeric powder for making Upma (2gm of turmeric powder per 10 gm of semolina) which was subjected to sensory evaluation at the day of preparation by the panel of six judges. For organoleptic evaluation, five-point hedonic rating was used. The score ranged from 'excellent' (5) to 'poor' (1).

3. Result and Discussion

The result on the present experiment along with appropriate discussion are presented below on table 1.

3.1 Yield parameter

3.1.1 Fresh weight

The maximum fresh weight of mother rhizome (59.28 gm) and finger rhizome (228.53 gm) per plant was recorded in treatment T2 (Suranjana) it might be due to genetic factor rather than environmental conditions and similar result was reported by Aiyaduri (1966) [1] Subbarayudu *et al.* 1976 [10] and Singh *et al.* 2013 [9]. Similarly, Total fresh rhizome

weight (287.82 gm) per plant was recorded maximum in treatment T2 (Suranjana).

3.1.2 Diameter of rhizome

The diameter of mother rhizome (4.50 cm) and diameter of finger rhizome (2.44 cm) was recorded maximum for treatment T2 (Suranjana). The high green yield has positive correlation with diameter and similar result was confirmed by Kumar *et al.* 2017 [5].

3.1.3 Dry weight of rhizome

The maximum dry weight of mother rhizome (16.22 gm) and finger rhizome (50.53 gm) was observed in treatment T2 (Suranjana). The probable reason for higher dry weight of mother and finger rhizome is due to less moisture loss during drying of The probable reason for higher dry weight of finger rhizome is due to less moisture loss during drying of rhizome.

3.1.4 Dry matter percentage

The dry matter percentage of mother rhizome (30.05%) and finger rhizome (32.37%) was recorded highest in treatment T2 (Suranjana). The dry matter percentage depends upon genotype of turmeric varieties similar result was also reported by Reddy *et al.* (1998) [8].

3.1.5 Recovery percentage

The maximum recovery percentage for sundried turmeric (27.21%) Fig. 1 and boiled turmeric (25.39%) Fig. 2 was observed in treatment T2 (Suranjana). Ghosh and Govind (1982) [13] and Anandraj *et al.* (2004) [14] reported that most of the short duration and medium duration genotypes have more recovery percentage than long duration types. However, the recovery percentage also depends on the genotype of varieties.

3.1.6 Length shrinkage

The minimum percentage of length shrinkage of sundried turmeric (32.32%) Fig. 3 and length shrinkage of boiled turmeric (44.55%) Fig. 4 was recorded in treatment T2 (Suranjana). Mayor *et al.* (2004) [15] reported that heating cause stress in cellular structure causing change in shape and decrease in dimension.

3.2 Quality parameters

Considerable variation was observed in curcumin percentage of sundried turmeric and boiled dried turmeric among the different turmeric varieties under present experiment. (Table 2). The curcumin percentage for sundried turmeric powder ranges from 3.0% (T1) to 6.5% (T4). The maximum curcumin percentage (6.2%) was recorded in PDKV Waigaon (T4). The minimum curcumin percentage (3.0%) of sundried turmeric was recorded in C.G. Haldi-1 (T1). Similarly, curcumin percentage for boiled dried turmeric powder ranges from 2.3% (T1) to 5.8% (T4). The maximum curcumin percentage (5.8%) was recorded in PDKV Waigaon (T4). The minimum curcumin percentage (2.3%) of boiled dried turmeric was recorded in T1 C.G. Haldi-1 (T1).

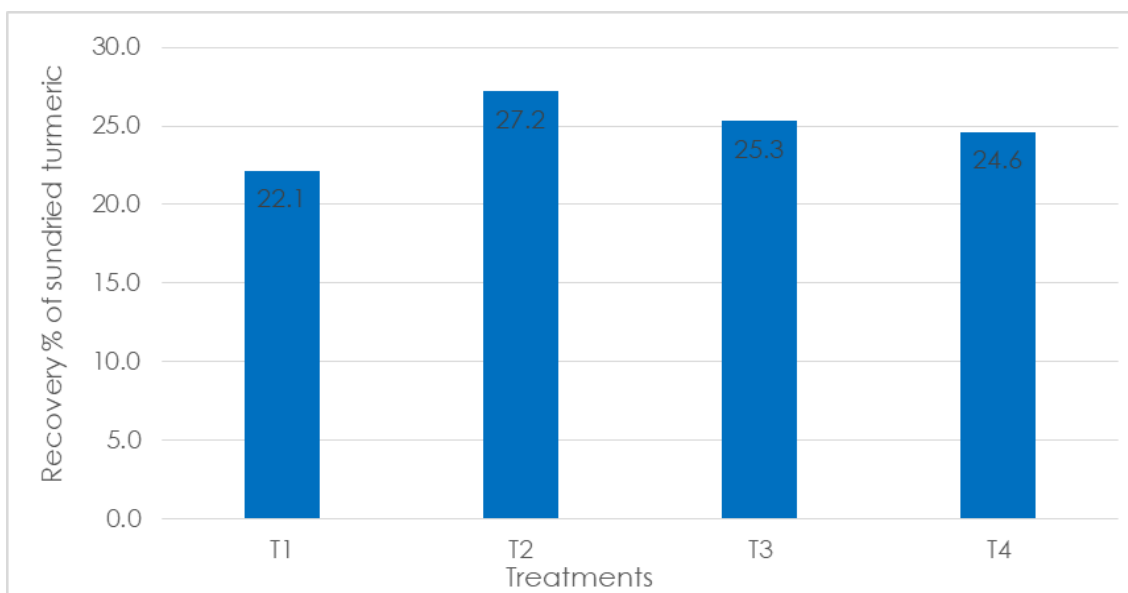


Fig 1: Recovery percentage of sundried turmeric

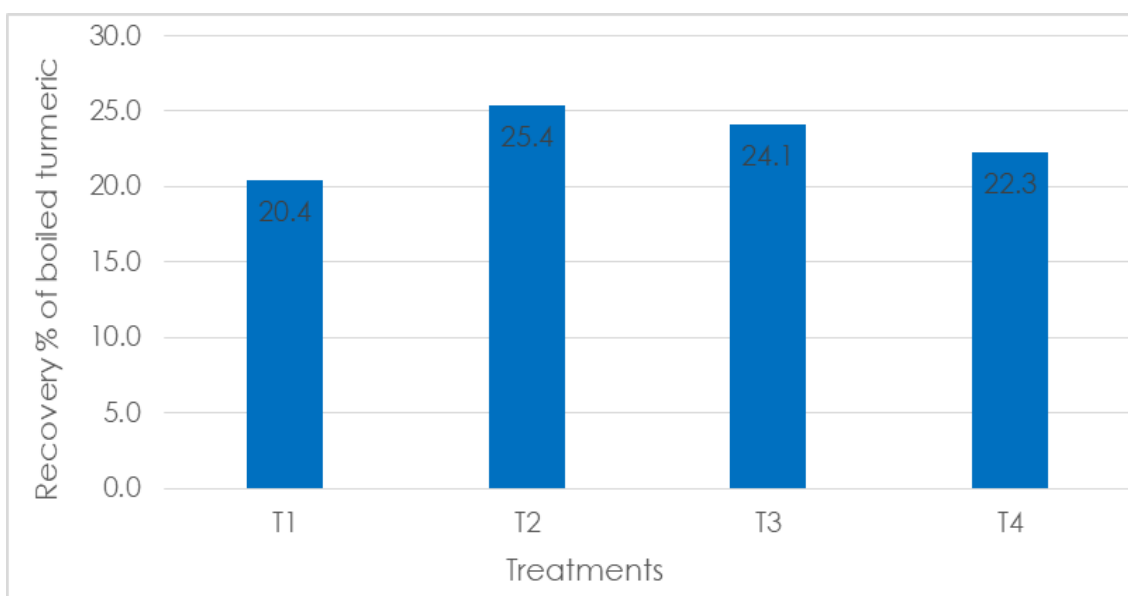


Fig 2: Recovery percentage of boiled turmeric

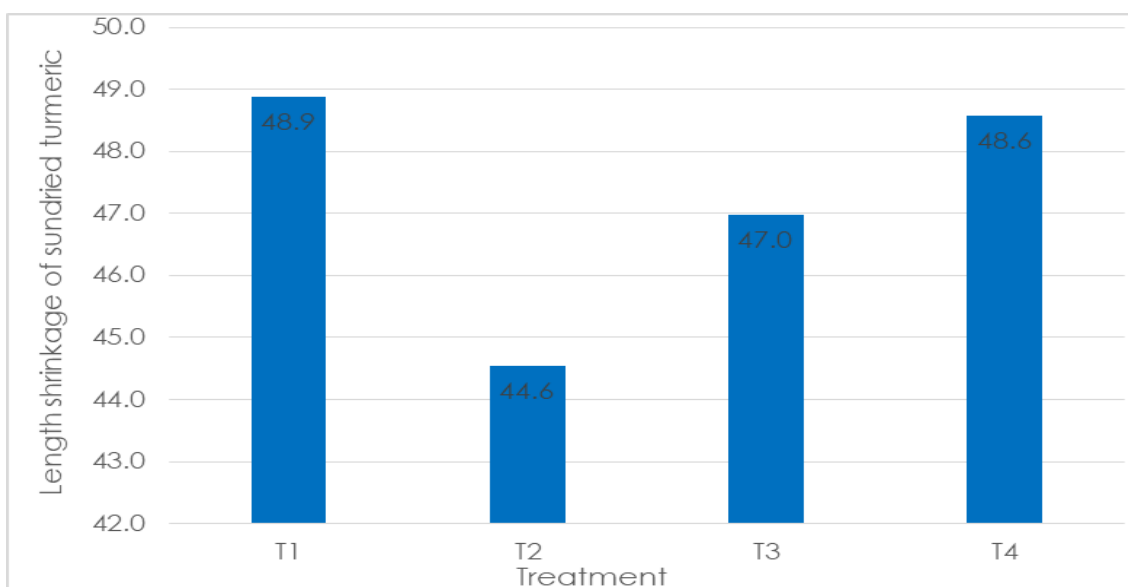


Fig 3: Length shrinkage of sundried turmeric

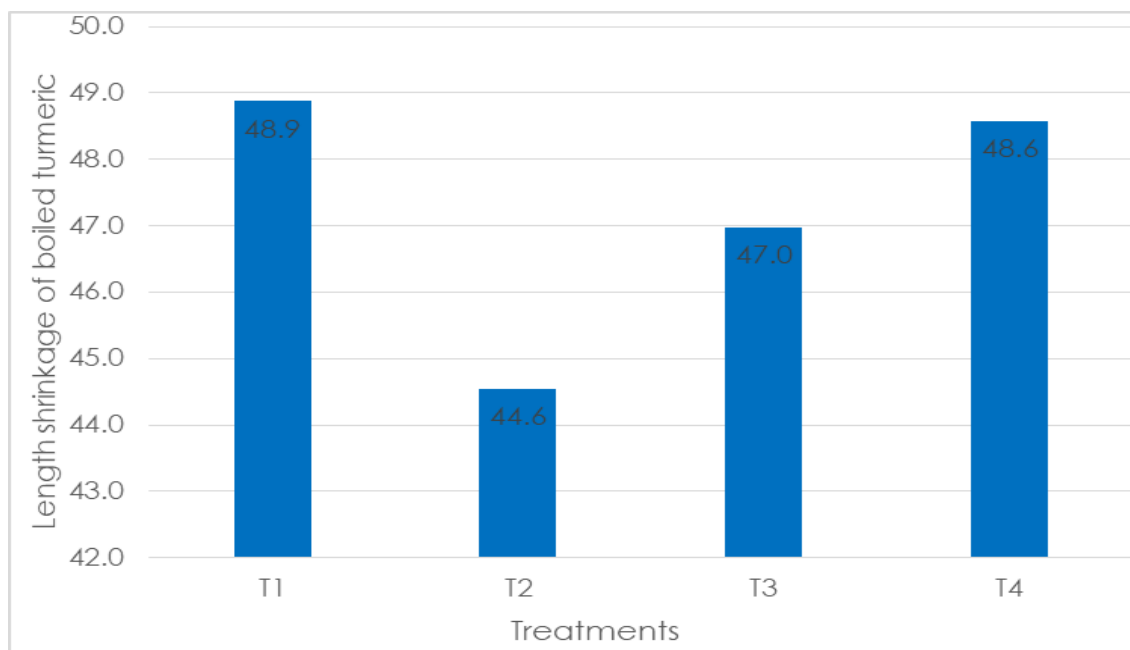


Fig 4: Length shrinkage of boiled turmeric

Table 1: Yield parameters

Treatment	Fresh weight of mother rhizome	Fresh weight of finger rhizome	Total fresh rhizome weight	Number of primary rhizome per plant	Diameter of mother rhizome	Diameter of finger rhizome	Dry weight of mother rhizome	Dry weight of finger rhizome per plant
T1	26.53	120.70	147.08	4.45	3.31	1.58	7.55	28.29
T2	59.28	228.53	287.82	7.15	4.50	2.44	16.22	50.53
T3	48.76	174.67	223.44	5.65	3.70	2.30	12.17	38.93
T4	39.03	133.93	172.96	4.40	2.95	1.75	9.44	29.58
C _{at 5%}	1.48	1.27	1.71	0.38	0.15	0.07	0.29	0.78
SEm	0.47	0.40	0.55	0.12	0.04	0.02	0.07	0.25

Treatment	Dry matter % of mother rhizome	Dry matter % of finger rhizome	Recovery % of sundried turmeric	Recovery % of boiled turmeric	Length shrinkage of sundried turmeric	Length shrinkage of boiled turmeric
T1	24.19	21.22	22.14	20.43	36.26	48.88
T2	30.05	32.37	27.21	25.39	32.32	44.55
T3	27.35	28.77	25.31	24.14	34.17	46.98
T4	25.62	23.50	24.62	22.31	34.72	48.58
C _{at 5%}	0.63	0.49	0.45	0.47	2.00	1.38
SEm	0.20	0.16	0.14	0.15	0.64	0.44

T1 (C.G. Haldi-1), T2 (Suranjana), T3 (IISR Pragati), T4 (PDKV Waigaon)

Table 2: Performance of varieties in respect of quality parameters

Notation	Treatments	Curcumin % in sundried turmeric powder	Curcumin % in boiled dried turmeric powder
T1	C.G. Haldi-1	3.0%	2.3%
T2	Suranjana	5.1%	4.9%
T3	IISR Pragati	4.5%	4.3%
T4	PDKV Waigaon	6.2%	5.8%

3.3 Organoleptic evaluation

A jury of six judges assessed the turmeric powder (sundried and boiled turmeric powder) for its colour, aroma and taste under five-point hedonic rating. The data recorded ranges from 1.583 (T1) to 4.50 (T5). Treatment T4 recorded the maximum score for colour, aroma and taste (5, 3.750 and 5) while, the minimum score for colour, aroma and taste (2, 1 and 1.750) was recorded by T1. The organoleptic evaluation

of sundried turmeric powder is presented on (Table 3) The data recorded ranges from 1.58 (T1) to 4.33 (T5). Treatment T4 recorded the maximum score for colour, aroma and taste (4.250, 5 and 4.33) while, the minimum score for colour, aroma and taste (1.750, 2 and 1.00) was recorded by T1. The organoleptic evaluation of boiled dried turmeric powder are presented on (Table 4).

Table 3: Organoleptic evaluation of sundried turmeric powder

Notation	Colour	Aroma	Taste	Overall acceptability	Rating
T1	2.00	1.00	1.75	1.58	Poor
T2	4.00	2.75	4.25	3.66	Very good
T3	3.25	1.75	2.75	2.58	Good
T4	5.00	3.75	5.00	4.50	Excellent

Table 4: Organoleptic evaluation of boiled dried turmeric powder

Notation	Colour	Aroma	Taste	Overall acceptability	Rating
T1	1.75	2.00	1.00	1.58	Poor
T2	3.25	4.20	2.25	3.25	Very good
T3	2.00	3.00	2.20	2.41	Acceptable
T4	4.25	5.00	4.00	4.33	Excellent

4. Conclusion

In the present investigation, treatment T2 (Suranjana) recorded highest value for fresh weight of mother rhizome, fresh weight of finger rhizome, total fresh rhizome weight, no. of primary rhizome per plant, diameter of mother rhizome, diameter of finger rhizome, dry weight of mother rhizome, dry weight of finger rhizome, dry matter percentage of mother rhizome, dry matter percentage of finger rhizome, recovery percentage of sundried turmeric, recovery percentage of boiled turmeric. In case length shrinkage of sundried turmeric and length shrinkage of boiled turmeric T2 (Suranjana) recorded minimum value indicating positive characteristic. Thus, it can be concluded that treatment T2 (Suranjana) is superior for yield attributing traits.

The observation recorded in respect of curcumin percentage showed significant difference in both sundried turmeric powder and for boiled dried turmeric powder. Among all treatments, maximum curcumin percentage was recorded for treatment T4 (PDKV Waigaon) followed by T2 (Suranjana). Similarly, organoleptic evaluation for both sundried turmeric powder and for boiled dried turmeric powder was found best for treatments T₄ (PDKV Waigaon) for various parameters of organoleptic evaluation (colour, taste, and aroma) followed by treatment T2 (Suranjana). Thus, on the basis of overall performance it can be concluded that Suranjana (T2) is superior in terms of yield, quality and culinary purpose.

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