



## Research Article

# EVALUATION OF GINGER (*Zingiber officinale* Rosc.) GERMPLASM FOR ITS QUALITY IN GANGETIC ALLUVIAL PLAINS OF WEST BENGAL

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**Abstract-** The experiment was conducted to evaluate the Ginger (*Zingiber officinale* Rosc.) germplasm for its quality in Gangetic alluvial plains of West Bengal at Department of Spices and Plantation Crops, Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal during 2015-16. The ginger germplasm taken for the experiment were namely, T<sub>1</sub>-Athira, T<sub>2</sub>-Karthika, T<sub>3</sub>-Aswathy, T<sub>4</sub>-Acc-65, T<sub>5</sub>-Acc-219, T<sub>6</sub>-GCP-49, T<sub>7</sub>-Acc-91, T<sub>8</sub>-Acc-701, T<sub>9</sub>-Acc-723, T<sub>10</sub>-Acc-239, T<sub>11</sub>-Acc-87, T<sub>12</sub>-Acc-713, T<sub>13</sub>-Acc-278, T<sub>14</sub>-Acc-702, T<sub>15</sub>-Acc-247 and T<sub>16</sub>-Gorubathan (control.). The investigation revealed that the highest essential oil percentage was recorded with T<sub>8</sub>-Acc-701 (1.71 %) followed by T<sub>5</sub>-Acc-219 (1.66 %), T<sub>16</sub>-Gorubathan (Control.) (1.59 %) and was lowest with T<sub>10</sub>-Acc-239 (0.92 %). The oleoresin percentage was recorded maximum with T<sub>4</sub>-Acc-65 (9.25%) followed by T<sub>2</sub>-Karthika (8.73 %) and the lowest with T<sub>13</sub>-Acc-278 (3.30%). Further, maximum dry recovery (33.28%) was recorded with T<sub>5</sub>-Acc-219 followed by T<sub>4</sub>-Acc-65 (32.57 %), T<sub>7</sub>-Acc-91 (32.22 %) and the lowest dry recovery was found in T<sub>3</sub>-Aswathy (25.91 %). Therefore, the results led to a conclusion that the germplasm having better quality parameters such as essential oil content with T<sub>8</sub>-Acc-701 (1.71%); Oleoresin content with T<sub>4</sub>-Acc-65 (9.25%) and Dry recovery with T<sub>5</sub>-Acc-219 (33.28%) were found to be the most suitable for its quality under Gangetic alluvial plains of West Bengal.

**Keywords-** Germplasm, Ginger, Essential Oil, Oleoresin Content, Dry Recovery.

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## Introduction

Ginger (*Zingiber officinale* Rosc.) is one of the earliest known oriental spices and is being cultivated in India for underground modified stem called rhizomes which is used both as fresh vegetable and as a dried spice, since time immemorial. Ginger is obtained from the rhizomes of *Zingiber officinale* Rosc., which belongs to the family Zingiberaceae. It is mainly grown in Darjeeling, Kalimpong, Nadia, Bhagwanpur areas of West Bengal. Ginger is used as carminative, diuretic and expectorant. It is effective against migraine headache [1] and diarrhoea [2]. Indian ginger in the world market is known for its quality which mainly comes from Kerala in the international market is known for its quality. Because of its quality nearly 10 to 15 percent of Indian ginger is exported to about 50 countries around the world. Netherlands is the largest importer of Ginger products accounting for exports worth USD 426,050.81 followed by United Kingdom and United States of America which imports Ginger products worth USD 415,148.45 and USD 389,521.72 respectively. Value added spice products like spice oils and oleoresins notched a significant high with figures of 11,475 tones earning Rs. 1,910.90 crores, registering a growth of 1% in volume and 10 % in value (Spices Board, 2016) [3]. Due to pleasant, pungent and spicy aroma ginger is used in the manufacture of a number of food products like ginger bread, confectionary, curry powders, certain curried meats, table sauces, pickle and in manufacturing of soft drinks like cordials, ginger cocktail, carbonated drinks, etc. It is also used in alcoholic beverages like ginger brandy, ginger wine and ginger beer etc. The ginger oil obtained from dry ginger powder is used as a flavoring agent in confectionary, preservation and for soft drinks. Ginger oil can be extracted from fresh ginger also.

A fine quality oleoresin is obtained from dried powdered ginger by extraction. Ginger oleoresin (commercially known as Gingerin) contains about 18 to 20 percent 'gingerol' which is the main pungent principal. Inspite of immense scope and possibility for the development of this crop in West Bengal, very little attempt has so far been made to utilize the agro-ecological conditions of the state ranging from sea-coast to an altitude of about 12,000 ft. Commercial cultivation of ginger is mainly restricted in the district of Darjeeling though it can be successfully cultivated in large scale in the plains of West Bengal also where there is some irrigation facilities. The commercial ginger cultivation in the plains of West Bengal is restricted mainly due to insufficient information's on improved agro-techniques. Keeping these in view, The present investigation was undertaken to find out the most suitable variety/ varieties performing better towards quality attributing characters under gangetic alluvial plains of West Bengal.

## Materials and Methods

The experiment was conducted at Department of Spices and Plantation Crops, Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal conducted during 2015-16. The germplasm under the experiment were T<sub>1</sub>-Athira, T<sub>2</sub>-Karthika, T<sub>3</sub>-Aswathy, T<sub>4</sub>-Acc-65, T<sub>5</sub>-Acc-219, T<sub>6</sub>-GCP-49, T<sub>7</sub>-Acc-91, T<sub>8</sub>-Acc-701, T<sub>9</sub>-Acc-723, T<sub>10</sub>-Acc-239, T<sub>11</sub>-Acc-87, T<sub>12</sub>-Acc-713, T<sub>13</sub>-Acc-278, T<sub>14</sub>-Acc-702, T<sub>15</sub>-Acc-247 and T<sub>16</sub>-Gorubathan (control.). Observations were recorded on quality parameters like,

1. Essential oil (%) content of the freshly harvested rhizome was estimated by

steam distillation process and the percentage of the estimated essential oil was calculated using the following formula.

$$\text{Essential oil content (\%)} = \frac{\text{Essential oil extracted (ml)}}{\text{Weight of sample (g)}} \times 100$$

- Oleoresin content (%) content of the powdered rhizome was extracted with acetone by keeping it over night. It was then distilled off, dried, the oleoresin weighed and the percentage of oleoresin was calculated using the following formula.

$$\text{Oleoresin content (\%)} = \frac{\text{Weight of oleoresin (g)}}{\text{Weight of sample (g)}} \times 100$$

- Dry recovery (%) content was calculated from selected clump of ginger by weighing. It was then kept in drier at 55°C for about 72 hours and the weight were taken at certain interval. It was continued till there were no further decrease in weight between two consecutive weights, which indicate that there will be no moisture remaining in the sample. The dry recovery was expressed as percentage (%) by using the following formula.

$$\text{Dry recovery (\%)} = \frac{B}{A} \times 100$$

Where A = Sample weight of rhizome (g)

B = Weight of sample after drying (g)

Then the data collected were subjected to statistical analysis to the randomized block design by following procedure laid out [4]. For determination of standard error of mean (S. Em.±) and the value of critical difference (C. D) between the treatment means as 5% level of significance [5].

## Results and Discussion

The results of the present investigation revealed that [Table-1] the quality parameters like essential oil (%) content was recorded with T<sub>8</sub>-Acc-701 (1.71 %) followed by T<sub>5</sub>-Acc-219 (1.66 %) and T<sub>16</sub>-Gorubathan (Control.) (1.59 %). The essential oil content was not appreciable with T<sub>10</sub>-Acc-239 (0.92 %) followed by T<sub>1</sub>-Athira (1.01 %), T<sub>12</sub>-Acc-713 (1.03 %) and T<sub>13</sub>-Acc-278 (1.04 %). The ginger oil content varied from 1.00 % to 2.00 % with Rajgarh local recording highest and SG-603 [6]. The cv SG 61 produced high ginger oil (2.28 and 2.05%) and oleoresin (5.17 and 5.27%) contents but had a high crude fibre content and poor yield under rainfed and irrigated conditions [7]. An essential oil content of 1.9 %, 2.0 % and 2.1 % for cultivars Suprabha, Suruchi and Suravi respectively [8].

**Table-1** Quality attributing characters of different germplasm of ginger

Treatments	Essential oil content (%)	Oleoresin content (%)	Dry recovery (%)
T <sub>1</sub> - Athira	1.01	6.25	27.83
T <sub>2</sub> - Karthika	1.17	8.73	28.66
T <sub>3</sub> - Aswathy	1.11	8.25	25.91
T <sub>4</sub> - Acc-65	1.23	9.25	32.57
T <sub>5</sub> - Acc-219	1.66	8.35	33.28
T <sub>6</sub> - GCP 49	1.08	4.15	27.84
T <sub>7</sub> - Acc-91	1.31	7.75	32.22
T <sub>8</sub> - Acc-701	1.71	5.25	29.81
T <sub>9</sub> - Acc-723	1.26	7.88	29.14
T <sub>10</sub> - Acc-239	0.92	3.75	31.71
T <sub>11</sub> - Acc-87	1.29	7.45	31.92
T <sub>12</sub> - Acc-713	1.03	3.35	29.18
T <sub>13</sub> - Acc-278	1.04	3.30	30.87
T <sub>14</sub> - Acc-702	1.11	5.15	29.95
T <sub>15</sub> - Acc-247	1.22	5.90	31.02
T <sub>16</sub> -Gorubathan (control.)	1.59	4.42	28.21
S.Em±	0.16	0.53	0.71
C.D. @ 5%	0.47	1.53	2.06

In the present experiment the highest oleoresin percentage was recorded with T<sub>4</sub>-Acc-65 (9.25%) followed by T<sub>2</sub>-Karthika (8.73 %) and the lowest with T<sub>13</sub>-Acc-278 (3.30%) followed by T<sub>12</sub>-Acc-713 (3.35 %) and T<sub>10</sub>-Acc-239 (3.75 %). Oleoresin percentage was also highest in Suravi (10.30%) under subtropical humid region of West Bengal [9]. The oleoresin content of Varada (4.0%), Suruchi (3.9%) and Suprabha (4.0%) in southern West Bengal condition respectively [10]. Further, maximum dry recovery (33.28%) was recorded with T<sub>5</sub>-Acc-219. High dry recovery was also recorded with T<sub>4</sub>-Acc-65 (32.57 %), T<sub>7</sub>-Acc-91 (32.22 %) and T<sub>11</sub>-Acc-87 (31.92 %). The lowest dry recovery was found in T<sub>3</sub>-Aswathy (25.91 %) followed by T<sub>6</sub>-GCP 49 (27.84 %) and T<sub>1</sub>-Athira (27.83 %). In another experiment the dry recovery of (20.60%), (23.45%) and (20.30%) with Suprabha, Suravi and Gorubathan respectively [9]. They found that the (21.12%) and (20.81%) dry recovery with Mahima and Rejatha respectively [11]. The maximum dry recovery (33.84 %) was with Sambuk local cv. and lowest was found with Rejatha (27.97 %) [10]. It appears that agro-climatic condition and cultural practices have influence on determining the quality characters.

Agro-climatic conditions, variety and plant population are the limiting factors in the production and quality of ginger [12]. Quality analysis revealed that some amount of variation exists with respect to the locations, the oleoresin percentage of Mahima and Rejatha was 4.48% and 6.64% respectively under Kerala condition [11].

## Conclusion

The results led to a conclusion that for Gangetic alluvial plains of West Bengal the cultivars having better quality parameters such as essential oil content – T<sub>8</sub>-Acc-701 (1.71%), T<sub>5</sub>-Acc-219 (1.66 %) and T<sub>16</sub>-Gorubathan (local.) (1.59%); Oleoresin content – T<sub>4</sub>-Acc-65 (9.25%), T<sub>2</sub>-Karthika (8.73%) and T<sub>3</sub>-Aswathy (8.25%); Dry recovery – T<sub>5</sub>-Acc-219 (33.28%), T<sub>4</sub>-Acc-65 (32.57%) and T<sub>11</sub>-Acc-87 (31.92%) which will be suitable for processing.

**Application of research:** This germplasm should also be encouraged for cultivation in the state as globalization has open up new vista for export. It is expected that after a few years of trial some of the germplasms may prove potential with regard to quality after well acclimatized with the local environment.

**Research Category:** Spices and Plantation Crops

## Abbreviations

T: Treatment/s  
@: at the rate of  
cv: Cultivar  
Rs: Rupees  
ml: millilitres  
etc: et cetera (= and the rest)  
CD: Critical difference  
SEm: Standard error mean  
%: Percentage  
g: gram  
ft: feet  
USD: United States of Dollar  
°C: Degree centigrade  
Acc: Accessions

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