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Evaluation of Ginger (*Zingiber officinale* Rosc.) Genotypes for Quality Attributes

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ABSTRACT

Ginger (Zingiber officinale Rosc.) is important spice crop grown and exported from India. It is valued for its aroma, pungency and medicinal value. Essential oil, oleoresin and fibre content contribute to its quality. The wide number of local varieties available in the country provides opportunity to find the best performing one. The field experiment was taken up to evaluate the ginger genotypes for its quality at the Department of Plantation, Spices, Medicinal and Aromatic Crops, Kittur Rani Channamma College of Horticulture, Arabhavi, Karnataka during 2015-2016. There was significant variation for quality among genotypes. The essential oil content ranged between 1.32 % to 2.25 %, Oleoresin content varied from 3.69 % to 7.35 % and fibre content found to be varying between 3.34 % to 5.72 %.

Key words: *Ginger genotypes, Essential oil, Oleoresin, Fibre content.*

INTRODUCTION

India is known as the land of spices from the time immemorial and has been the leading country in the world for production, consumption and export of spices. Ginger (*Zingiber officinale* Rosc.) is one of the oldest known spices valued for its aroma and pungency due to essential oil and oleoresin content. Indian ginger popularly known as cochin ginger, mainly comes from kerala is known for its quality in the world market. In India, it is grown in an area of 1,32,620 ha with an annual production of 6,55,060 MT and productivity of 4.9 MT/ha[2]. Among the states, Orissa occupies 11.94 percent of total area and Assam is the largest producer with 18.67 percent of total production of the country. The average productivity of the crop at present is very low (4.9 MT per ha). There is tremendous scope to increase the yield per unit area and there by the total production. Apart from increasing the yield there is need to look for the quality aspect of ginger. The minimum fibre and higher essential oil and oleoresin is of superior quality. Combining both high yield and quality helps to fetch premium price in the international market.

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A good amount of genetic variability has been reported among different varieties with regard to yield and quality parameters under different agro-climatic conditions. Sanwal *et al*[18]., observed variation for essential oil content (1.10 % in Khasi Local to 1.90 %) and crude fibre content (5.16 % in China to 8.03 % in Burdwan). Chongtham *et al*[4]., recorded the highest oleoresin content (10.25 %) in cv.Suravi and the least was observed in Sambuk Local (3.00 %). Sasikumar *et al*[20]., reported the minimum crude fibre content in Acc. 294 (2.32 %) and maximum (4.00 %) in Acc. 35 (IISR Rajatha). The available germplasm serves as most valuable natural reservoir for providing donor parent to improve the quality[6]. Therefore, collection, conservation and evaluation of germplasm are essential for present as well as future crop improvement programmes.

MATERIAL AND METHODS

The field experiment was taken up to evaluate ginger genotypes for its quality at the Department of Plantation, Spices, Medicinal and Aromatic Crops, Kittur Rani Channamma College of Horticulture, Arabhavi, Karnataka during 2015-2016. The twelve ginger genotypes were laid out in Completely Randomized Block Design, replicated thrice. The land was brought to fine tilth by repeated ploughing and harrowing. Ginger varieties were planted in raised bed of 3.00 m length, 1.0 m width and 15 cm height during the june month. Seed rhizomes having 3 to 4 buds weighing about 20-25g were treated with mancozeb (3g/l), Chloropyrifos (4 ml/litre) and Streptomycin sulphate (0.5g/litre) solution for half an hour and dried in shade for twelve hours. Treated rhizomes were planted in the beds at 3.5 to 4.0 cm depth at a distance of 30 cm between rows and kept at 20 cm apart. The land was applied with FYM (25 t/ha) and recommended dose of P and K (50:50 kg P and K/ha) at the time of land preparation. Recommended N was applied in split doses, 50 percent of the N was applied one month after the planting and remaining 50 percent of the N was applied one month after the first application. Cultivation practices were followed as per recommended package of practices. The crop was harvested when leaves started withering by digging out the rhizomes after drying up of leaves which indicated complete maturity. Harvested rhizomes were cleaned to remove adhering soil and sticking roots.

Essential oil content on fresh weight basis was obtained by steam distillation of freshly harvested rhizomes using Clevenger type apparatus[1]. The oleoresin content was obtained by taking the Pre-weighed finely ground ginger powder and extracting for 18 hours in soxhlets apparatus with anhydrous petroleum ether. The extract was transferred to a capsule and kept for evaporation at room temperature. Then it was dried in hot air oven at 110^0c till the loss in weight between successive weighing was less than 2 mg. The amount of non volatile ether extract was computed by using the formula given below[3].

$$\text{NVEE \% by weight on dry weight basis} = \frac{\text{Loss in wt. of sample (g)}}{\text{Weight of sample taken (g)}} \times 100$$

The crude fibre content was estimated by taking Pre-weighed ground ginger powder (2g) was extracted in soxhlets apparatus for 18 hours with petroleum ether. The dried material was boiled with 200 ml of sulphuric acid (1.25%) for 30 minutes, then filtered through muslin cloth and washed with boiling water. Then residue was boiled with 200 ml of sodium hydroxide (1.25%) for 30 minutes, filtered through muslin cloth and washed with 25 ml of boiling sulphuric acid (1.25%) and water. The residue was transferred to weighing (W_1) ashing dish. First, the residue was dried for two hours at 130 ± 2^0c and weight was

taken (W_2). After that it was ignited for 30 minutes at 600 ± 15^{0}c and reweighed (W_3). The crude fibre content in ginger rhizome was estimated by using the formula suggested by Maynard[13].

$$\text{Crude fibre (\%)} = \frac{(W_2 - W_1) - (W_3 - W_1)}{\text{Weight of the sample (g)}} \times 100$$

RESULTS AND DISCUSSION

Essential oil content

All the quality parameters varied significantly among the ginger genotypes. The data pertaining to quality parameters is furnished in Table 1. The essential oil is important in ginger as the cumulative effect of the essential oil components imparts the perfumery smell to ginger. The essential oil content ranged between 1.32 to 2.25 %. The highest essential oil content was obtained in Suravi (2.25 %) which was on par with Humnabad Local (2.13 %), Rajatha (2.04 %) and Suruchi (1.93 %). The essential oil content was lowest in Himachal (1.32 %). These results are comparable with earlier studies. Kurubar[12] observed the highest essential oil content in Rio-de-Janeiro (2.40 %) and the lowest in Mahima (1.00 %). Jaleel and Sasikumar[8] reported essential oil content ranging from 0.9 to 4.0 percent in ginger genotypes. Nileema *et al*[16]., reported higher essential oil content in Varada (1.38 %), Mahima and Rajatha (1.36 %). Kale[10], Kale *et al*[11]., Tiwari[23], Sasikumar *et al*[20]., Hegde *et al*[7]., Neerja and Korla[15], Sanwal *et al*[18]., also reported the variation in essential oil content among ginger genotypes.

Oleoresin content

Oleoresin is an important quality parameter which is responsible for flavor and pungency in ginger. The oleoresin content in the genotypes ranged from 3.69 to 7.35 %. Humnabad Local recorded maximum oleoresin content (7.35 %) and it was on par with Rajatha (6.12 %). Minimum oleoresin content was recorded in Jorhat-2 (3.69 %). Nileema *et al*[16]., observed higher oleoresin content in Mahima (3.94 %) and lowest in Rajatha (3.58 %). Chongatham *et al*., reported oleoresin content to be varying from 3.00 % in Sambuk Local to 10.25 % in Suravi. Similar results about variation in oleoresin content were observed by several workers[5,8,10,11,12,14,15,17,20,21,22].

Crude fiber content

Fiber content is the most important criteria for assessing the suitability of ginger rhizome for specific products. The lower fibre content is desirable in ginger for the manufacture of processed food. Whereas, higher fibre containing varieties are suitable for dry ginger making. The fibre content ranged from 3.34 to 5.72 percent. The minimum fibre content was recorded in Varada (3.34 %) which was on par with Rajatha (3.42 %), Suravi (3.62 %), Jorhat-2 (3.72 %) and Humnabad Local (3.86 %).The maximum fibre content was recorded in Himagiri (5.72 %). Kurubar[12] reported the lowest fibre content in genotype Basavakalyana (3.10 %) and the highest was observed in Mahima (5.18 %). Sanwal *et al*[18]., reported that the crude fibre content ranged from 5.16 in China to 8.03 percent in Burdwan. Neerja and Korla[15] reported variation for fibre content from 3 to 6.3 percent. Similarly, the variation for fibre content was reported by earlier workers[7,8,9,10,11,14,19,20,21].

The genotypes like Humnabad Local, Rajatha, Suravi, Suprabha and Suruchi found to be superior with higher essential oil, oleoresin and lower fibre conent. These can be utilised for producing higher yield of ginger with quality.

Table 1: Essential oil, oleoresin and fibre content in ginger genotypes

Sl. No.	Genotypes	Essential oil content (%)	Oleoresin content (%)	Fibre content (%)
1	Varada	1.67	4.53	3.34
2	Mahima	1.73	4.46	4.27
3	Rajatha	2.04	6.12	3.42
4	Suprabha	1.86	5.63	4.40
5	Suravi	2.25	5.23	3.62
6	Himagiri	1.57	4.27	5.72
7	Himachal	1.32	3.85	4.13
8	Jorhat-2	1.43	3.69	3.72
9	Bidar-1	1.63	4.16	4.22
10	Bidar-2	1.70	4.31	4.08
11	Humnabad Local	2.13	7.35	3.86
12	Suruchi	1.93	4.87	3.67
	S.Em ±	0.13	0.44	0.21
	C. D (0.05)	0.37	1.29	0.60
	CV (%)	12.22	15.67	8.80

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