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EVALUATION OF SOME IMPORTANT GINGER GENOTYPES IN TERAI REGION OF WEST BENGAL

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Abstract: A co-ordinate varietal trial of some important genotypes was organized in the field gene bank of Uttar Banga Krishi Viswavidyalaya from 2013-14 to 2016-17. The trial was conducted to measure the performances and suitability of genotypes in the terai region of West Bengal. 8 genotypes/accessions namely V1S1 (OUAT, Pottangi-Orissa), Varada (IISR, National check) (IISR), Acc 219 (IISR, Kerala)), GCP-5 (Garubathan, West Bengal, local check), Acc-65 (IISR, Kerala), RG 32 (Dholi- Bihar), GCP 49 (UBKV- Pundibari, West Bengal) and RG-3 (Dholi- Bihar) were taken for co ordinate varietal trial in terai region of West Bengal. Highest rhizome yield per plot was found in GCP-49 (11.19 kg)/plot compared to other genotypes in terai region of West Bengal. It is also found that dry matter content of the variety GCP-49 was highest compared to other varieties (21.7%). Dry matter content is one of the most important parts for qualitative parameters of ginger, so GCP 49 was found to be the best among the selected genotypes of the investigation.

Keywords: Variability, Terai region, Co-ordinated varietal trial, Path analysis, characterization, National check, Local check.

Introduction

Ginger (*Zingiber officinalis* L.) is a tropical perennial herb belonging to the family Zingiberaceae. Some efforts have been reported to identify the genetic potential of ginger germplasm from India. However, very few investigations have been reported about the characterization and evaluation of ginger from north-eastern India (Chandra *et al*, 1997; Rajyalakshmi *et al,* 2013*;* Cintra *et al*, 2005). Germplasm collection is the main source of variability for ginger genetic improvement, these collections is specially contributed in India and most of the genetic diversity is found (Chandra *et al*, 1997; Chaudhary *et al*. 2006; Lynrah *et al*. 1998). Ginger (*Zingiber officinalis* L.) is an important spice crops in the world. It is extensively used in culinary application, cosmetic, pharmaceutical and dyeing industries. Indian ginger has the high demand in the world market. Essential oils and oleoresin have the active principles in ginger rhizomes and are known to have some medicinal properties. Ginger has been used efficiently in the treatment of circulatory problems, liver diseases, digestive disorders (Osawa *et al*., 1995; Senwal *et al*., 1997) like spice turmeric. In order to

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meet the export and internal demands of ginger, production has to be increased. For its long crop duration, rhizomatous nature and high productivity it requires heavy input of fertilizers, water, plant protection chemicals.

Materials and Methods

The present investigation was conducted during the summer season of 2013-2014, 2014-2015, 2015-16 and 2016-17 at the University Farm of Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar. The farm is situated at 26°19′ 86″ N latitude, 89°23′ 53″ E longitude with an altitude of 43 m above the mean sea level. The experimental site falls under sub Himalayan terai agro-climatic condition. The average annual rainfall is 3000 mm and most of which is received during June to September. During the experimental period, the temperature was higher at the beginning and then gradually decreases. The maximum temperature varied from 33.4°C to 23.5°C while minimum temperature varied from 26.0°C to 9.0°C during February. Overall crop faces mild temperature throughout the crop growth period.

During the experimentation period crop faces high rainfall during growth period of Turmeric. The highest rainfall occurs during the month of July to September. Humidity was very high throughout the experimentation period. In many cases, it reached up to 91.4% and the minimum was 59.5 %.

The investigation was carried out in field gene banks of Uttar Banga Krishi Viswavidyalaya, IISR (Kozhikode) Kerala, Pottangi (Orisha, OUAT), Dholi (Bihar) YSR University Solan in the year 2013-14, 2014-15, 2015-16 and 2016-17. Number of genotypes chosen for the assessment of genetic diversity was 11 including one check of GCP-5 and National Check Varada for the overall assessment. The design of experiment was taken as Randomized Block Design (RBD) and three replications were taken and genotypes namely ACC 219, ACC 65, V1S12, RG32, RG3, GCP-49, GCP-5 (Local Check), VARADA (National Check).

Planting was done in raised beds of 3 m × 1 m plot size with a spacing of 30 cm row to row and 20 cm plant to plant having 40 plants per plot. The important attributes like plant ht, tiller no., no. of leaves per plant, leaf length, leaf breadth, rhizome yield/plot, projected yield(t/ha), disease incidence (PDI) were measured to find out the best genotypes in their corresponding quantitative and qualitative parameters.

Total experimental area was divided into unit plots of 3 m x 1 m size according to the need for each experiment to accommodate all the treatments each having three replications. Channel of 40 cm width demarcated each replication and each plot was separated by 0.25

meter width furrow. Standard package of practices were adopted for the investigation. The crop was harvested after cleaning the dry shoots from the field in 2013-14, 2014-15, 2015-16 and 2016-17 by digging out the rhizomes after complete maturity as indicated by the drying up of leaves and falling of down of plants, which varied with the genotypes.

Experimental Design: The experiment was subjected to RBD (Randomized Block Design) to find out the best genotype which is statistically significant in the quantitative as well as qualitative parameters (Gomez and Gomez, 1984).

Table-1: Sources of Turmeric genotypes

S.N	Germplasm	Place of origin	Latitude	Longitude	Altitude	District	State
1.	ACC 219, ACC 65, Varada (National check)	IISR, Kerala	22.930 N	88.530E	9.75m	Kozhikode	Kerala
2.	V1S1	Pottangi, Orisha	37°34'N	126°57'E	87m	Koraput	Orissa
3.	RG-3, RG-32	Dholi, Bihar	25.99 N	85°80 E	55 m	Muzaffarpur	Bihar
4.	GCP-49, GCP -5 (Local check)	Pundibari, West Bengal	26.52 N	89°10 E	66 m	Coochbehar	WB

Results and Discussion

Pooled Mean Analysis

Analysis of mean data pooled over 4 years (2013-14, 2014-15, 2016-17 and 2016-17) for the different growth and yield parameters are presented in Table No.2. Highest plant height was recorded from GCP 49 (56.43 cm). RG-3 showed the highest mean value (9.30) than other genotypes in number of tillers per plant (Table-2) compared to other genotypes. In respect of number of leaves/plant, among the 8 selected genotypes (Table-1) GCP-49 was recorded highest number of leaves per plant (14.72 cm). For pseudo stem girth also, GCP-49 scored highest (2.88) compared to other genotypes. In respect of leaf length, GCP-49 recorded the highest mean leaf length (21.20 cm). GCP-49 recorded highest leaf breadth (2.54 cm). Highest rhizome yield per plot was found in GCP-49 (11.19 kg)/plot. Projected yield per plot was found highest in GCP-49 (22.55 t/ha). It was recorded that GCP-49 was found to have 149% increase over local check GCP-5 and 309.21% greater than the yield of Varada.

In case of disease incidence (PDI), highest disease incidence was found in ACC-219 (42.84) and lowest was found in GCP 49 (16.47 PDI).

In case of co ordinate varietal trial done separately in Dholi, IISR, Pottangi and Solan apart from West Bengal, UBKV Pundibari, fresh yield of rhizome per ha of GCP 49 was found to

have highest over other genotypes (14.0t/ha) which is 59.09% higher than national check and 42.85% higher than local check of each states (Table-3) taking mean pooled value of the genotypes in the field experiment.

In case of quality parameters of ginger, dry matter percentage of GCP 49 was found to be highest than other genotypes (Table-4) (21.7%). Dry matter % was one of the important parameters which cause the quality value of the ginger (Joyeshree *et al* 2014). Essential ol percentage was found 1.3% and oleoresin percentage was found 4.1% as per the measurements made by Dr. YS Parmer University of Horticulture Solan. In qualitative parameters, dry matter percentage is one of the most important parameters for its export quality and trading value.

Conclusion

It was concluded from the conservation programme of ginger that in the terai region, genotypes like GCP-49, V1S12, on the basis of yield per plot, projected yield per plot, incidence of disease (%). GCP-49 was found highest yield/plot, highest projected yield/plot and lowest in disease incidence. These are the very important characters of ginger for conservation, evaluation and multiplication in this region.

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Table-2: Evaluation of different ginger genotypes in terai region of West Bengal

Entries	Plant height (cm)	Tiller No	No. of leaves	Pseudo stem girth (cm)	Leaf length (cm)	Leaf breadth (cm)	Rhizome yield/plot (Kg)	Projected yield (t/ha)	% increase over local check	% increase over national check	Disease incidence (PDI)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(12)	(13)	(14)
V1S12	54.67	6.88	13.36	2.25	18.81	**1.85**	5.92	11.93	48.00	102.04	30.18
VARADA	51.80	**5.46**	13.67	**2.05**	16.61	1.90	**2.93**	**5.93**	-	-	35.57
ACC-219	**44.03**	6.59	11.21	2.17	17.64	2.07	3.60	7.24	-	22.86	**42.84**
RG-3	53.66	**9.30**	12.50	2.10	17.63	1.92	4.97	10.01	24.25	69.62	47.33
ACC-65	54.63	8.39	13.80	2.43	18.98	2.04	4.61	9.28	15.25	64.16	48.69
GCP-5	51.01	7.36	12.61	2.28	17.72	2.04	4.00	8.06	-	36.51	23.29
GCP-49	**56.43**	8.03	**14.72**	**2.88**	**21.20**	**2.54**	**11.19**	**22.55**	179.75	309.21	16.47
RG-32	46.92	8.31	**10.82**	2.10	**15.11**	1.94	3.05	6.16	-	4.09	41.96
SEM (±)	2.788	0.598	1.038	0.323	1.586	0.297	0.491	1.455	-	-	0.990
C.D.(0.05)	8.283	0.845	NS	NS	4.71	NS	1.459	4.322	-	-	2.941
C.V. (%)	15.12	12.36	14.16	23.82	14.357	14.29	16.762	10.113	-	-	16.76

Table 3: Mean of Pooled growth parameters of Ginger under CVT-2013 in four different years (2013-14 to 2015-16) in different states of India

Entries	Fresh rhizome Yield (t/ha)						% increase over National Check	% increase over Local Check
	IISR	Pottangi	Pundibari	Dholi	Solan	Mean		
Acc-65	19.4	12.8	10.1	1.5	7.8	10.3		
Acc-219	16.8	7.7	7.0	1.2	6.6	7.9		
V1S1-2	15.1	14.3	13.8	2.0	9.1	10.8		
GCP-49	20.1	14.1	25.4	1.2	9.2	14.0	59.09	42.85
RG-3	18.3	11.8	11.2	5.1	9.8	11.2		
RG-32	14.1	13.9	4.4	5.0	7.7	9.0		
Varada	14.7	12.7	6.1	0.9	9.6	8.8		
LC	12.0	12.9	8.3	3.7	12.2	9.8		
Mean	16.5	12.3	12.3	2.6	9.0	10.5		
Local Check	Rio de ganeiro	Suprabha	GCP-5 Garubathan	Nadia	Giriganga	-		
SEM (±)	1.28	0.5	0.82	0.6	0.18	-		
C.D.(0.05)	4.56	1.9	2.94	2.14	0.63	-		
C.V. (%)	16.5	9.3	14.1	49.38	4.13	-		

Table 4: Details of Pooled data of 2013-14, 2014-15 and 2015-16 of dry recovery(%), essential oil content, oleoresin content and crude fibre (%) of Ginger CVT trials

Collection	Dry Recovery (%)	Essential Oil (%)	Oleoresin content (%)	Crude fibre (%)
	Mean	Mean	Mean	Mean
Acc-219	20.44	1.10	4.2	4.9
Acc-65	19.63	0.95	3.7	4.7
V_1S_1-2	21.1	1.2	4.2	4.3
RG-32	21.1	1.3	4.3	5.2
RG-3	21.4	1.0	3.9	4.4
GCP-49	**21.7**	**1.3**	**4.1**	**5.3**
Varada (NC)	20.6	1.0	3.5	4.2
GCP-5 (Local check)	17.22	1.02	3.44	4.46
SEM(±)	0.08	0.11	0.09	0.18
CD (0.05)	0.23	0.34	0.19	0.39
C.V.(%)	3.18	1.33	2.70	4.76