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Evaluation of some cooking type watermelon [(*Citrullus lanatus* (Thunb.) Matsum and Nakai] genotypes under Laterite belt of Eastern India

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ABSTRACT

Fourteen cooking type watermelon, locally known as khero, were assessed for various growth and yield parameters and yield under red and laterite zone of West Bengal, India. The result indicated the presence of significant variation among the genotypes for all the studied traits.Genotype VC-23 was produced maximum vine length. On the basis of flowering and harvesting time, VC-12-2, VC-22 and VC-25 were identified as early types. Genotype VC-14-1, which produce maximum fruit length, average fruit weight and fruit yield plant^{-1}, can be suggested to grow commercially under red and laterite zone of West Bengal. Genotype VC-12-2, which was an early genotype, produced maximum number of fruits plant^{-1} and good yielder, can be utilized as valuable breeding material.

Keywords **:** *Citrullus*, cucurbitaceae, flowering, fruit yield, landrace, West Bengal.

Watermelon (*Citrullus lanatus* (Thunb.) Matsum. & Nakai) is a warm season crop belongs to the family Cucurbitaceae. According to Fursa (1981), *Citrullus lanatus* has divided into three sub species: *Citrullus lanatus* var. *lanatus*, *C. lanatus* var. *citroides* and *C. mucusospermus*. However, Reddy *et al.* (2013) includes red sweet dessert type, white flesh types and egusi watermelon under *Citrullus lanatus* var. *lanatus*. In Namibia, Maggs-Kölling and Christiansen (2003) grouped the local watermelons into three distinct types: watermelons for fresh consumption, cooking melons, and seed melons. In India, the area under watermelon is 101.08 thousand ha and production of 2520.10 thousand MT. Among the states of India, Uttar Pradesh stands second in area and first in production (13.74 thousand ha and 619.65 thousand MT). West Bengal ranked first in area (16.60 thousand ha) and fourth in production (234.30 thousand MT) (Ministry of Agriculture & Farmers Welfare, 2018).

Watermelon is grouped under vegetable but valued for its sweet red juicy fruit particularly during hot and dry season. Watermelon rind is used as pickle making. Watermelon seeds are rich in oil percentage, which are used in pharmaceutical industry for drug making. In some parts of Africa, the immature fruits of watermelon landraces are used as vegetables (Maggs-Kölling *et al.*, 2000; Loukou *et al*., 2007 and Dolo Nantoumé *et al*., 2012). Mahla and Choudhary (2013) reported the indigenous landraces of cooking type watermelons from Rajasthan, India. The neglected and underutilized species play a crucial role in the food security, diet diversification and income generation. Basic understanding on agro-climatic need, development of suitable production technology and creation of marketing channels are required to maximize the economic value of underutilized vegetable crops. Cooking type watermelon, locally known as *Khero*, is an underutilized cucurbitaceous vegetable. It is commonly grown in western lateritic belt of West Bengal during spring-summer months mostly in river beds. The immature fruits of this crop are used as vegetable; while mature fruits are occasionally taken as dessert especially during hot summer.

Presence of variation among the genotypes provides good opportunity to the breeder for the selection of desired types. Selection of superior genotypes is practiced to obtain high yield, good quality, uniformity of produce, disease resistance, abiotic stress tolerance etc. The improved genotypes can be directly used as varieties, which serve the farmers' to get maximum market benefit. On the other hand, selected genotypes can also be used in various hybridization programmes for genetic enhancement. Very little research work has been carried out in cooking type watermelon in India as well as in the world. Therefore, the current research programme was conducted with the objective to study the performance of some cooking type watermelon landraces in relation to yield and other traits under red and laterite zone of West Bengal.

Fourteen cooking type watermelon genotypes were grown and assessed for various traits in Horticulture Farm of Institute of Agriculture, Sriniketan dring summer

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Table 1: Cooking type watermelon genotypes used in the present study

Sl. No.	Genotypes	Source
1.	VC-3-4	Department of Horticulture and Post-Harvest Technology
2.	VC-5-1	Department of Horticulture and Post-Harvest Technology
3.	VC-5-2	Department of Horticulture and Post-Harvest Technology
4.	VC-5-3	Department of Horticulture and Post-Harvest Technology
5.	VC-7-2	Department of Horticulture and Post-Harvest Technology
6.	VC-12-2	Department of Horticulture and Post-Harvest Technology
7.	VC-12-3	Department of Horticulture and Post-Harvest Technology
8.	VC-13-3	Department of Horticulture and Post-Harvest Technology
9.	VC-14-1	Department of Horticulture and Post-Harvest Technology
10.	VC-21	Sudam Ghosh, Geetgram, Block-Bolpur, Birbhum district, West Bengal
11.	VC-22	Krishi Mandi, Sriniketan Bazar, Bolpur,
12.	VC-23	Firoz Khan, Badasimulia, Block-Bolpur, Birbhum district, West Bengal
13.	VC-24	Tapas Mondal, Raipur, Block-Bolpur, Birbhum district, West Bengal
14.	VC-25	Ainul Khan, Badasimulia, Block-Bolpur, Birbhum district, West Bengal

2018. The experimental site was represents the sub-humid, subtropical lateritic belt of West Bengal, which is located in the eastern part of India. The soil of the experimental site was sandy loam in texture with PH 6.48 and 0.31per cent in organic carbon. The available nitrogen content was 198.2 kg ha^{-1}, the available phosphorous content was 42.4 kg ha^{-1} and the available potassium content was 176.9 kg ha^{-1}. The crop was grown in Randomized Block Design with three replications. Bed and channel system of planting was followed for growing this crop. The spacing was kept 2.5 m between channels and 50 cm between plant to plant. The channel width was kept 50cm. Pre-soaked seeds of cooking type watermelons were sown on 8th February 2018 in one side of the channel.

Out of fourteen, nine genotypes (VC-3-4, VC-5-1, VC-5-2, VC-5-3, VC-7-2, VC-12-2, VC-12-3, VC-13-3, VC-14-1) were taken from the Department of Horticulture and Post-Harvest Technology which were previously collected, purified and maintained since 2015 (Mohanta and Mandal, 2019a). The rest five genotypes (VC-21, VC-22, VC-23, VC-24 and VC-25) were collected from different areas of Birbhum district (Table 1). Observations on vine length, days to first male and female flower opening, node to first male and female flower appearance, days to first fruit harvest, fruit length and circumference, number of fruits $plant^{-1}$, average fruit weight and fruit yield $plant^{-1}$ were recorded from five random competitive plants per treatment and per replication. TSS of fruits was taken in the Departmental laboratory using a digital hand-held pocket refractometer (PAL-1) by ATAGO CO. LTD, Japan. The difference exhibited in genotypes for various characters were tested for significance at 5 and 1per cent by 'F' test (Fisher and Yates, 1963) using analysis of variance (ANOVA) tool. The test of significance of the difference between means of two genotypes for a character was done by 't' test and Least Significant Difference (LSD) was calculated.

It was revealed from the analysis of variance that cooking type watermelon genotypes were significantly differed among themselves at 1% level of significance for all the studied traits. The result indicated the existence of genetic variability in the studied cooking type watermelon genotypes. Mohanta and Mandal (2019a) reported significant differences among vegetable purpose watermelon genotypes for different characters grown under lateritic belt of West Bengal. The mean data of various traits obtained from the experiment were analyzed, presented (Table 2, 3 & 4) and discussed below :

Vine length, flowering and harvesting traits

The vine length was ranged between 2.6 and 4.6 m with an average length of 3.2 m. Genotype VC-23 was produced maximum vine length. Similarly, VC-12-3 was observed to produce shortest vine length, which was noted statistically at par with VC-5-1, VC-21, VC-13-3, VC-24, VC-7-2, VC-14-1, VC-25 and VC-5-3.Variation in vine length in vegetable purpose watermelon was reported by Mohanta and Mandal (2019a). Watermelon landrace produced the highest yield owing to its long vine and extensive branching (Gichimu *et al*., 2010).The time of flowering of any fruit-bearing vegetable crop is important as it correlated with early or late harvesting of crop. In cucurbits, early flowering and fruiting are considered as highly desirable traits as it pave the early marketing opportunity. Days to first male and female flower opening were ranges from 34.0 to 44.6 days and 48.2 to 60.7 days respectively. The genotype VC-12-2 was observed to produce male flower in minimum

Table 2: Analysis of variance for different characters in cooking type watermelon.

Source	D. F.	Vine length (m)	Days to first male flower opening	Days to first female flower opening	Node to first male flower appearance	Node to first female flower appearance	Days to first fruit harvest	Number of fruit per plant	Average fruit weight (g)	Fruit length (cm)	Fruit circumference (cm)	Fruit yield / plant (kg)	Total soluble solids (°Brix)
Replication	2	0.91	0.44	21.50	1.18	1.37	4.45	1.75	1174.4	27.85	1.69	0.101	0.10
Treatment	13	0.93**	32.41**	34.53**	12.50**	17.59**	40.12**	3.76**	24004.41**	28.13**	33.48**	1.361**	0.99**
Error	26	0.14	6.69	5.20	1.93	4.06	7.07	0.22	967.5	6.25	4.77	0.052	0.12

*Note: ** means statistically significant at p=0.01.*

number of days, which was found statistically at par with VC-22, VC-12-3, VC-5-3, VC-23 and VC-25. The genotype VC-12-2 recorded minimum number of days for opening of first female flower, which was found statistically at par with VC-23 and VC-3-4. It was found that average 39.1 and 54.5 days required for first male and female flower opening. The number of node from base of the plant was varied from 7.8 to 14.3 at which first male flower was appeared. On the other hand, the node to first female flower appearance was ranged from 17.6 to 24.1. General mean of node to first male and female flower appearance was noted 11.1 and 22.7 respectively. Male flower appeared in lower node in genotypes VC-12-2 and VC-25, which was found statistically at par with genotype VC-12-3, VC-24 and VC-5-1. Genotype VC-12-2 was noted for appearance of female flower in lower node from the base of the plant, which was found statistically at par with VC-25. On the basis of days to flowering and node number at which flowers appeared, the genotype VC-14-1 was identified as a late type. Number of days required for first fruit harvest varied from 61.7 to 73.3. It was found that genotype VC-12-2 took minimum number of days for first fruit harvest followed by VC 25 and VC 22 ; Whereas genotype VC-7-2 shown the maximum number of days for first fruit harvest. Average 69.1 or almost 70 days required for first fruit harvest in cooking type watermelon genotypes. In watermelon, variation in days to flowering and node number for appearance of flowering was reported by Mohanta and Mandal (2016) and Mohanta and Mandal (2019b) from the same study location. Maggs-Kölling and Christiansen (2003) compared local landraces of watermelon to modern varieties and noted variation in earliness. In watermelon, variation in harvesting time was reported by Mondal *et al*. (1989).

Yield parameters, yield and TSS

The mean number of fruits plant^{-1} was ranged from 8.3 to 3.7.Average 5.7 numbers of fruits plant^{-1} was recorded in immature stage. Genotype VC-12-2 was produced maximum number of fruits plant^{-1}, followed by VC-5-2, VC-7-2, VC-12-3, VC-14-1, VC-23 and VC-5-3. Variation on number of fruits plant^{-1} in watermelon was reported by More *et al.* (2015), Mohanta and Mandal (2016) and Mohanta and Mandal (2019b). In Bangladesh, Mondal *et al*. (1989) observed that the number of fruits plant^{-1} and fruit diameter had high positive correlation and direct effect on fruit yield. The mean fruit weight was observed 392.6 g. Average fruit weight of cooking type watermelon was varied from 275.0 to 608.4 g. Among the genotypes, VC-14-1 was observed to produce highest average fruit weight, followed by VC-24, VC-22, VC-5-3 and VC-21. Fruit length was ranged from 17.3 to 28.5 cm with an average

Table 3: Vine length, flowering and harvesting of cooking type watermelon genotypes.

Genotypes	Vine length (cm)	Days to first male flower opening	Days to first female flower opening	Node to first male flower appeared	Node to first female flower appeared	Days to first fruit harvest
VC-3-4	3.4	43.8	57.7	12.5	22.0	72.8
VC-5-1	2.7	40.7	52.3	10.0	24.0	70.7
VC-5-2	3.7	42.3	54.3	11.3	23.1	68.1
VC-5-3	3.2	36.5	52.4	12.8	24.1	72.3
VC-7-2	2.9	38.5	54.1	13.2	22.0	73.3
VC-12-2	3.4	34.0	48.2	7.8	17.6	61.7
VC-12-3	2.6	36.1	57.9	9.4	21.8	68.1
VC-13-3	2.8	41.5	53.5	11.8	26.3	71.0
VC-14-1	3.2	44.6	60.7	14.3	27.1	72.3
VC-21	2.7	39.1	54.7	10.3	22.3	68.1
VC-22	3.8	35.5	50.7	12.3	23.5	64.7
VC-23	4.6	36.6	59.1	13.0	22.3	72.3
VC-24	2.8	41.3	52.4	9.4	22.2	67.7
VC-25	3.0	37.2	54.5	7.8	19.5	64.0
LSD (0.05)	**0.6**	**4.3**	**3.8**	**2.3**	**3.4**	**4.5**

Table 4: Yield parameters, yield and TSS of cooking type watermelon genotypes.

Genotypes	Number of fruits plant^{-1}	Average fruit weight (g)	Fruit length (cm)	Fruit circumference (cm)	Fruit yield plant^{-1} (kg)	TSS (^{0}Brix)
VC-3-4	5.5	285.0	22.1	33.0	1.6	3.8
VC-5-1	5.2	359.8	24.8	34.1	1.9	2.4
VC-5-2	6.5	338.2	19.8	30.8	2.2	3.4
VC-5-3	5.9	461.7	22.6	28.5	2.7	4.0
VC-7-2	6.2	333.3	19.3	33.2	2.0	2.5
VC-12-2	8.3	345.0	18.0	30.1	2.9	4.1
VC-12-3	6.5	360.3	19.6	22.7	2.4	3.4
VC-13-3	5.0	275.0	17.3	26.2	1.4	2.4
VC-14-1	6.5	608.4	28.5	27.6	4.0	3.1
VC-21	5.2	450.0	21.5	25.5	2.3	3.5
VC-22	5.5	466.6	23.7	32.1	2.6	2.8
VC-23	6.0	394.4	25.5	27.1	2.3	3.5
VC-24	3.7	468.8	21.3	26.9	1.7	3.5
VC-25	4.3	350.0	21.9	28.0	1.5	3.8
LSD (0.05)	**0.8**	**52.2**	**4.2**	**3.7**	**0.4**	**0.6**

value of 21.8 cm. The highest fruit length was observed in genotype VC-14-1, which was noted statistically at par with VC-23 and VC-5-1. Fruit circumference was varied from 22.7 to 34.1 cm with average value of 29.0 cm. Maximum fruit circumferences was observed in genotype VC-5-1, which was statistically at par with VC-5-2, VC-22, VC-3-4 and VC-7-2. Fruit yield plant^{-1} is ultimate outcome of a fruit vegetable. The fruit yield per plant was ranged between 1.4 and 4.0 kg with a mean of 2.2 kg. Genotype VC-14-1 was noticed to produce highest fruit yield plant^{-1} followed by VC-22,VC-5-3 and VC-12-2. Whereas lowest fruit yield plant^{-1} was observed in genotype VC-13-3, which was found statistically at par with VC-25, VC-3-4 and VC-24. In watermelon, variation in fruit yield plant^{-1} was reported by More *et al*. (2015), Mohanta and Mandal

(2016) and Mohanta and Mandal (2019b). Maggs-Kölling and Christiansen (2003) reported that the watermelon yield varied from 118 t ha^{-1} for a giant cooking melon to only 10t/ha for the seed melon type. In Kenya, Gichimu *et al*. (2009) demonstrated high morphological diversity (54-42%) among wild accession, landrace and commercial cultivars of watermelon. Variation in fruit yield $plant^{-1}$ in vegetable purpose watermelon was reported by Mohanta and Mandal (2019a) from red and laterite zone of West Bengal. Total Soluble Solids (TSS) is an important parameter for quality determination in watermelon. The values of TSS ranged from 2.4 to 4.1 °Brix. Maximum TSS was observed in genotype VC-12-2, which was noted statistically at par with VC-5-3, VC-3-4, VC-25, VC-24, VC-23 and VC-21. In watermelon, variation in TSS was reported by Mohanta and Mandal (2016) and Mohanta and Mandal (2019b). Maggs-Kölling and Christiansen (2003) stated that cooking watermelons were less sweet than modern cultivars.

Thus, the present study showed that ample variation was present in cooking type watermelon genotypes and therefore, selection for early and / or productive genotypes can be practiced from the collected material. The genotypes VC-12-2, VC-22 and VC-25 were identified as early types on the basis of flowering and harvesting time. These genotypes can be utilized in breeding programme to induce earliness in high yielding genotypes by hybridization followed by selection in progenies. Genotype VC-14-1, which produce highest average fruit weight (608.4 g) and highest fruit yield $plant^{-1}$ (4 kg), can be suggested to grow commercially. Genotypes VC-12-2 (2.9 kg), VC-5-3 (2.7 kg) and VC-22 (2.6 kg) were also noted as good performers. Genotype VC-12-2, an early genotype, had maximum number of fruits $plant^{-1}$ (8.3) and good producer can also be suggested to grow commercially. Emphasis should be given to increase the productivity of this genotype.

REFERENCES

Dolo Nantoumé, A., Traoré, S., Christiansen, J.L., Andersen, S.B. and Jensen, B.D. 2012. Traditional uses and cultivation of indigenous watermelons (*Citrullus lanatus*) in Mali. *Inter. J. Biodivers. Conserv.*, **4**(13): 461-71.

Fisher and Yates, 1963. Statistical Tables for Biological, Agricultural and Medical Research, Longman Group Ltd Essex, England.

Fursa,T.B. 1972. K sistematikeroda *Citrullus* Schrad [On the taxonomy of genus *Citrullus* Schrad.]. Bot. Z. 1972; **57**: 31-41.

Gichimu, B.M., Owuor, B.O. and Dida, M.M. 2010. Yield of three commercial watermelon cultivars in Kenya as compared to a local landrace. *Afr. J. Hort. Sci.*, **3**: 24-33.

Loukou, A.L., Gnakri, D., Djè, Y., Kippré, A.V., Malice, M. and Baudoin, J.P. 2007. Macronutrient composition of three cucurbit species cultivated for seed consumption in Cote d' Ivoire. *Afr. J. Bitechnol.*, **6**(5): 529-33.

Maggs-Kölling, G.L. and Christiansen, J.L. 2003. Variability in Namibian landraces of watermelon (*Citrullus lanatus*). *Euphytica*, **132:** 251-58.

Maggs-Kölling, G. L., Madsen, S. and Christiansen, J.L. 2000. A phenetic analysis of morphological variation in *Citrullus lanatus*in Namibia. *Genet. Resour. Crop Evol.*, **47**: 385-93.

Mahla, H.R. and Choudhary, B.R. 2013. Genetic diversity in seed purpose Watermelon (*Citrullus lanatus*) genotypes under rainfed situations of Thar Desert. *Indian J. Agric. Sci.*, **83**(3): 300-03.

Ministry of Agriculture & Farmers Welfare. 2018. *Horticultural Statistics at a Glance.* Horticulture Statistics Division, Department of Agriculture, Cooperation & Farmers Welfare, Government of India. *www.agricoop.nic.in*

Mohanta, S. and Mandal, J. 2016. Performance of watermelon (*Citrullus lanatus*) in red and laterite zone of West Bengal. *J. Crop and Weed*, **12**(3): 175-77.

Mohanta, S. and Mandal, J. 2019a. Assessment of vegetable purpose watermelon [(*Citrullus lanatus* (Thunb.) Matsum and Nakai] genotypes collected from laterite belt of eastern India. *J. Pharmacogn. Phytochem.*, **8**(3): 2508-12.

Mohanta, S. and Mandal, J. 2019b. Evaluation of some watermelon hybrids and cultivars under Lateritic Belt of West Bengal. *J. Crop and Weed*, **15**(1): 78-82.

Mondal, S.N., Rashid, A., Inoue, K. and Hossain, A.K.M.A. 1989. Genetic variability, correlation and path-coefficient analysis in watermelon. *Bangaladesh J. Pl. Breed. Genetics*, **2**(1-2): 31-35.

More, S.G., Chudasama, V.R., Tekale, G.S., Salve, S.V. and Jarande, S.D. 2015. Performance of different varieties in respect of yield and quality of watermelon (*Citrullus lanatus* Thunb Mansf) under North Gujarat condition. *Ecol., Env. Conserv. Paper*, **21**: 105-08.

Reddy, U.K., Aryal, N., Islam-Faridi, N., Tomason, Y.R., Levi, A. and Nimmakayala, P. 2013. Cytomolecular characterization of rDNA distribution in various *Citrullus* species using fluorescent in situ hybridization. *Genet. Resour Crop Evol.*, **60**: 2091-2100.