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Performance of Bottle gourd (*Lagenaria siceraria* L.) genotypes for growth, yield and quality under Prayagraj agro-climatic condition

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Abstract

The present investigation was undertaken with 10 genotypes of bottle gourd i.e., (AVT-II/2019/BOGVAR-1, AVT-II/2019/BOGVAR-2, AVT-II/2019/BOGVAR-3, AVT-II/2019/BOGVAR-4, AVT-II/2019/BOGVAR-5, AVT-II/2019/BOGVAR-6, RITURAJ (check), GREEN INDIA (check), NATIONAL AGRO (check) AND SHANKAR (check)) for evaluating their performance for various horticultural characters under Prayagraj agro-climatic condition. It was conducted at the horticulture research farm, Department of Horticulture Naini Agriculture Institute, Sam Higginbottom University of agriculture, technology and Sciences (SHUATS), Prayagraj (U.P), during Zaid season 2022-23. The experiment was laid in randomized block design with three replications. The results from the present investigation concluded that Bottle gourd Genotype AVT-II/2019/BOGVAR-6 was recorded maximum number of female flowers (15.66), vine length (221.33 cm), number of fruits per plant (8.88 fruits), average yield per plant (5.71 kg/plant), average yield per hectare (342.44 q/ha), and maximum Benefit Cost ratio (4.6) which was found more productive and economically viable.

Keywords: Performance, genotypes, bottle gourd (*Lagenaria siceraria* L.)

Introduction

Bottle gourd [*Lagenaria siceraria* L.] ($2n=2x=22$) belongs to family Cucurbitaceae and is one of the most ancient crops cultivated during summer throughout the world. The genus *Lagenaria* is derived from the word lagena, meaning the bottle. It is also known as Calabash, Doodhi and Lauki in different parts of India. Its primary centre of origin is Africa. The fossil records indicate its culture in India even before 200 B.C. It has been found wild in India, the Moluccas and Ethiopia. It has spread to western countries from India and Africa. The genus *Lagenaria* includes six species that are distributed in Africa, Indo-Malaysia and the neotropics. There is only one cultivated species, *Lagenaria siceraria*, which is annual and monoecious. The five other species are wild, perennial and dioecious, occurring in East Africa and Madagascar.

The fruit make delicious supplement to the human diet and 100 g of fruits contain nearly 96g water, 0.2g protein, 0.1g fat, 2.5g carbohydrate, 0.6g fiber, 0.5g minerals, 20mg calcium, 10mg phosphorus, 0.7mg iron, 0.3mg thiamine, 0.01 mg riboflavin and 0.2 mg niacin and energy 1.2 cal. The seeds are good sources of lipids and proteins and it contains 45% oil and 35% protein.

Materials and Method

Experimental Site

A field experiment was conducted during 12th February 2022 to 28th May 2022. Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.).

Experimental Material

The experiment was laid out in randomized block design (R.B.D.) with 3 replications of bottle gourd AVT Genotypes varieties. Bottle gourd AVT Genotypes varieties was transplanted in the field at a spacing of 250 cm x 60 cm in the plot of 7.5 m x 3 m size. Recommended dose of fertilizers i.e., 250:100:100 @ N: P2O5: K2O kg /ha. Normal cultural practices and plant protection measures were followed during the cultivation process.

Plants were selected at random from each plot of each variety as representative sample for recording the data.

Statistical analysis

The data recorded during the course of investigation were subjected to statistical analysis as per method of analysis of variance (Fisher, 1950). The significance and non-significance of the treatment effect were judged with the help of 'f' value (variance ratio) was compared with the table value at 5% level of significance. If calculated value exceeded then the value, the effect of considered to be significant.

Table 1: List of genotypes

Genotypes	Notation	Source
AVT-II/2019/ BOGVAR – 1	G1	IIVR Varanasi
AVT-II/2019/ BOGVAR – 2	G2	IIVR Varanasi
AVT-II/2019/ BOGVAR – 3	G3	IIVR Varanasi
AVT-II/2019/ BOGVAR – 4	G4	IIVR Varanasi
AVT-II/2019/ BOGVAR – 5	G5	IIVR Varanasi
AVT-II/2019/ BOGVAR – 6	G6	IIVR Varanasi
RITURAJ (Check)	G7	Unique Hybrid Seed
GREEN INDIA (Check)	G8	Green India Hybrid Seed
NATIONAL AGRO (Check)	G9	NAHS
SHANKAR (Check)	G10	Shankar Seed Company

Results and Discussion

Days to 2nd leaf stage

The minimum number of days to 2nd leaf stage was recorded in the genotype AVT-II/2019/BOGVAR- 6 (3.33) followed by the AVT-II/2019/BOGVAR-5 (3.66) and maximum number of days to 2nd leaf stage was recorded in the genotype RITURAJ (CHECK VARIETY) (6.00).

Days to 4th leaf stage

The minimum number of days to 4th leaf stage was recorded in the genotype AVT-II/2019/BOGVAR-6 (12.33) followed by the AVT-II/2019/BOGVAR-5 (12.60) and maximum number of days to 4th leaf stage was recorded in the genotype NATIONAL AGRO (CHECK VARIETY) (16.66).

Number of primary branches after 30 days

The maximum number of primary branches after 30 days was recorded in the genotype NATIONAL AGRO (CHECK VARIETY) (5.08) followed by the RITURAJ (CHECK VARIETY) (4.18) and minimum number of primary branches after 30 days was recorded in the genotype AVT-II/2019/BOGVAR-5 (3.43).

Number of primary branches after 60 days

The maximum number of primary branches after 60 days was recorded in the genotype NATIONAL AGRO (CHECK VARIETY) (8.07) followed by the GREEN INDIA (7.88) and minimum number of primary branches after 60 days was recorded in the genotype AVT-II/2019/BOGVAR-2 (5.77).

Days to 1st male flower emergence

The minimum number of days to 1st male flower emergence was recorded in the genotype SHANKAR (CHECK VARIETY) (31.55) followed by the AVT-II/2019/BOGVAR-4 (33.00) and maximum number of days to 1st male flower emergence was recorded in the genotype RITURAJ (CHECK VARIETY) (43.88).

Days to 1st female flower emergence

The minimum number of days to 1st female flower emergence was recorded in the genotype AVT-II/2019/BOGVAR-6 (45.77) followed by the AVT-II/2019/BOGVAR-5 (47.76) and maximum number of days to 1st female flower emergence was recorded in the genotype AVT-II/2019/BOGVAR-2 (54.77)

Node at 1st male flower emergence

The maximum number of node at 1st male flower emergence was recorded in the genotype AVT-II/2019/BOGVAR-1 (6.44) followed by the RITURAJ (CHECK VARIETY) (5.16) and minimum number of node at 1st male flower emergence was recorded in the genotype AVT-II/2019/BOGVAR-3 (3.66).

Node at 1st female flower emergence

The maximum number of node at 1st female flower emergence was recorded in the genotype GREEN INDIA (CHECK VARIETY) (4.55) followed by the SHANKAR (CHECK VARIETY) (4.11) and minimum number of node at 1st female flower emergence was recorded in the genotype AVT-II/2019/BOGVAR-1 (2.78).

Number of male flowers

The maximum number of male flowers was recorded in the genotype AVT-II/2019/BOGVAR-6 (29.66) followed by the AVT-II/2019/BOGVAR-4 (27.66) and minimum number of male flowers was recorded in the genotype SHANKAR (CHECK VARIETY) (20.33).

Number of female flowers

The maximum number of female flowers was recorded in the genotype AVT-II/2019/BOGVAR-6(15.66) followed by the AVT-II/2019/BOGVAR-5 (13.00) and minimum number of female flowers was recorded in the genotype AVT-II/2019/BOGVAR-1 (8.33).

Sex Ratio

The maximum male: female flowers ratio was recorded in the genotype AVT-II/2019/BOGVAR-2 (2.78) followed by the AVT-II/2019/BOGVAR-1 (2.76) and minimum male: female flowers ratio was recorded in the genotype SHANKAR (CHECK VARIETY) (1.74).

Vine length (cm)

The maximum vine length was recorded in the genotype AVT-II/2019/BOGVAR-6 (221.33) followed by the GREEN INDIA (CHECK VARIETY) (208.66) and minimum vine length was recorded in the genotype SHANKAR (CHECK VARIETY) (112.44).

Chlorophyll content

The maximum chlorophyll content was recorded in the genotype SHANKAR (CHECK VARIETY) (39.90) followed by the AVT-II/2019/BOGVAR-6 (36.33) and minimum chlorophyll content was recorded in the genotype AVT-II/2019/BOGVAR-3 (31.27).

Days to First fruit setting

The minimum days to first fruit setting was recorded in the genotype AVT-II/2019/BOGVAR-6 (49.44) followed by the AVT-II/2019/BOGVAR-5 (52.77) and maximum days to first

fruit setting was recorded in the genotype NATIONAL AGRO (CHECK VARIETY) (60.09).

Days to First fruit picking

The minimum days to first fruit picking was recorded in the genotype AVT-II/2019/BOGVAR-6 (65.22) followed by the AVT-II/2019/BOGVAR-5 (65.33) and maximum days to first fruit picking was recorded in the genotype AVT-II/2019/BOGVAR-1(70.09).

Number of fruits per plant

The maximum number of fruits per plant was recorded in the genotype AVT-II/2019/BOGVAR-6 (8.88) followed by the RITURAJ (CHECK VARIETY) (7.63) and minimum number of fruits per plant was recorded in the genotype SHANKAR (CHECK VARIETY) (4.33).

Yield per plant (kg)

The maximum yield per plant was recorded in the genotype AVT-II/2019/BOGVAR-6 (5.71) followed by the GREEN INDIA (CHECK VARIETY) (5.29) and minimum yield per plant was recorded in the genotype AVT-II/2019/BOGVAR-1 (1.69).

Yield per hectare (q)

The maximum yield per hectare was recorded in the genotype AVT-II/2019/BOGVAR-6 (342.44) followed by the GREEN INDIA (CHECK VARIETY) (317.4) and minimum yield per hectare was recorded in the genotype AVT-II/2019/BOGVAR-1 (101.4).

Average Fruit weight (g)

The maximum Average fruit weight was recorded in the genotype GREEN INDIA (CHECK VARIETY) (1136.3) followed by the SHANKAR (CHECK VARIETY) (1006.00) and minimum Average fruit weight was recorded in the genotype AVT-II/2019/BOGVAR-1 (364.00).

Fruit length (cm)

The maximum fruit length was recorded in the genotype GREEN INDIA (CHECK VARIETY) (39.00) followed by the SHANKAR (CHECK VARIETY) (38.00) and minimum fruit length was recorded in the genotype AVT-II/2019/BOGVAR-4 (12.00).

Fruit diameter (cm)

The maximum fruit diameter was recorded in the genotype AVT-II/2019/BOGVAR-4 (13.00) followed by the AVT-II/2019/BOGVAR-5 (12.00) and minimum fruit diameter was

recorded in the genotype AVT-II/2019/BOGVAR-1 (5.02).

TSS (o B)

The maximum TSS was recorded in the genotype NATIONAL AGRO (CHECK VARIETY)(2.00) followed by the GREEN INDIA (CHECK VARIETY) (2.0) and minimum TSS was recorded in the genotype AVT-II/2019/BOGVAR-6 (1.4).

Vitamin C content (mg/100gm)

The maximum vitamin C content was recorded in the genotype AVT-II/2019/BOGVAR-2 (10.55) followed by the AVT-II/2019/BOGVAR- 6 (10.36) and maximum vitamin C content was recorded in the genotype GREEN INDIA (CHECK VARIETY) (8.92).

Net return

The maximum net income per hectare was obtained by AVT-II/2019/BOGVAR-6 i.e., 403218 INR and followed by GREEN INDIA (CHECK) i.e., 365658 INR and the minimum net return per hectare was obtained by AVT-II/2019/BOGVAR-6 i.e., 41658 INR

Benefit cost ratio

Among the different bottle gourd genotypes AVT-II/2019/BOGVAR-6 has the highest cost benefit ratio (4.6) followed by GREEN INDIA (CHECK) i.e. (4.3) and the minimum cost benefit ratio was showed by AVT-II/2019/BOGVAR-6 i.e. (1.3).

Fruit colour

The Fruit colour in different genotypes of bottle gourd was noted. Significantly the fruit colour was noted in the genotype AVT-II/2019/BOGVAR-1, AVT-II/2019/BOGVAR-2, AVT-II/2019/BOGVAR-3, RITURAJ (Check), GREEN INDIA (Check) were Medium green, AVT-II/2019/BOGVAR-4, AVT-II/2019/BOGVAR-5, NATIONAL AGRO (Check), were Pale green AVT-II/2019/BOGVAR-6, SHANKAR (Check) were Deep green.

Fruit shape

The Fruit Shape in different genotypes of bottle gourd was noted. Significantly the fruit shape was noted in the genotype AVT-II/2019/BOGVAR-1, AVT-II/2019/BOGVAR-2, AVT-II/2019/BOGVAR-3, AVT-II/2019/BOGVAR-6, RITURAJ (Check), GREEN INDIA (Check), NATIONAL AGRO (Check), SHANKAR (Check), were Cylindrical, AVT-II/2019/BOGVAR-5, AVT-II/2019/BOGVAR-6, were Round.

Table 2: Genotypes evaluation of bottle gourd with respect to growth parameters

Genotype	Days to 2 nd leaf stage	Days to 4 th leaf stage	Primary branches at 30 days	Primary branches at 60 days	Days to 1 st male flower emergence	Days to 1 st female flower emergence	Node at 1 st male flower emergence	Node to 1 st female emergence
AVT-II/2019/BOGVAR-1	4.33	14.66	3.85	6.44	38.55	54.44	5.44	2.44
AVT-II/2019/BOGVAR-2	4.00	14.22	3.62	5.77	38.33	54.77	3.88	2.55
AVT-II/2019/BOGVAR-3	4.66	14.66	3.86	7.44	35.55	53.22	3.66	2.99
AVT-II/2019/BOGVAR-4	4.00	14.46	3.77	5.78	33.00	49.22	4.16	2.83
AVT-II/2019/BOGVAR-5	3.66	12.60	3.43	7.44	34.99	47.76	3.44	3.10
AVT-II/2019/BOGVAR-6	3.33	12.33	4.03	7.55	34.44	45.77	3.99	3.44
RITURAJ (Check)	6.00	16.00	4.18	7.81	43.88	53.33	3.99	2.99
GREEN INDIA (Check)	4.20	14.00	4.15	7.88	40.50	51.44	3.55	3.55
NATIONAL AGRO (Check)	5.00	16.66	5.08	8.07	43.66	53.33	4.22	3.11
SHANKAR (Check)	4.00	17.00	3.63	7.37	31.55	51.55	3.77	3.10

F-Test	S	S	S	S	S	S	S	NS
S.Ed(+)	0.36	0.38	0.22	0.37	1.81	2.30	0.85	0.54
C.D at 5%	0.76	0.80	6.67	6.31	3.81	4.82	26.08	22.02
C.V	10.24	3.23	0.45	0.77	5.95	5.46	1.80	1.14

Table 3: Genotypes evaluation of bottle gourd with respect to Yield parameters

Genotype	Number of male flowers	Number of female flowers	Sex ratio	Days to Fruit setting	Days to Fruit picking	Vine length (cm)	Chlorophyll content	Number of fruits per plant
AVT-II/2019/BOGVAR-1	23.00	8.33	2.76	57.66	70.09	181.00	31.27	4.66
AVT-II/2019/BOGVAR-2	26.00	9.83	2.78	58.44	67.77	162.66	32.51	5.77
AVT-II/2019/BOGVAR-3	27.66	11.66	2.37	57.77	70.06	203.66	31.27	5.10
AVT-II/2019/BOGVAR-4	27.66	12.00	2.3	56.00	67.49	182.17	31.94	6.18
AVT-II/2019/BOGVAR-5	25.66	13.00	1.97	52.77	65.33	181.88	32.01	6.10
AVT-II/2019/BOGVAR-6	29.66	15.66	1.89	49.44	65.22	221.33	36.33	11.21
Rituraj (Check)	26.66	11.66	2.28	57.44	69.11	155.88	34.90	7.62
Green India (Check)	25.33	12.00	2.11	55.44	66.33	208.66	35.40	4.66
National Agro (Check)	22.64	8.66	2.61	60.09	67.11	136.66	35.70	4.86
Shankar (Check)	20.33	11.66	1.74	55.33	65.77	112.44	39.90	6.59
F-Test	S	S	S	S	S	S	S	S
S.Ed(+)	1.82	1.07	0.16	2.07	1.68	29.06	1.07	0.58
C.D at 5%	3.82	2.25	0.35	4.36	3.53	61.05	2.24	1.22
C.V	8.77	11.49	8.82	4.56	3.06	21.14	3.88	12.10

Table 4: Genotypes evaluation of bottle gourd with respect to Yield and Quality parameters

Genotype	Yield per plant (kg/plant)	Yield per hectare(q/ha)	Average Fruit Weight (g)	Fruit length (cm)	Fruit diameter (cm)	TSS (B°)	Vitamin C (100g)
AVT-II/2019/BOGVAR-1	1.69	101.4	364.00	24	5.02	1.7	9.40
AVT-II/2019/BOGVAR-2	2.75	165.00	478.00	27	5.09	1.5	10.55
AVT-II/2019/BOGVAR-3	2.76	165.6	543.00	31	6.02	1.8	9.59
AVT-II/2019/BOGVAR-4	3.66	219.6	593.00	12	13	2.0	10.18
AVT-II/2019/BOGVAR-5	3.89	233.4	638.0	12.5	12	1.9	9.41
AVT-II/2019/BOGVAR-6	7.24	434.44	646.0	36	5.05	1.4	10.36
RITURAJ (Check)	4.26	255.6	565.00	30	6.03	1.9	9.15
Green India (Check)	5.29	317.4	1136.3	39	7.05	2.0	8.92
National Agro (Check)	3.76	225.6	775.00	33	7.09	2.0	9.26
Shankar (Check)	6.62	397.2	1006.0	38	7.02	1.8	9.07
F-Test	S	S	S	S	S	S	S
S.Ed(+)	0.28	1.71	1.06	0.92	0.55	0.16	0.26
C.D at 5%	0.60	3.60	2.22	1.93	1.15	0.33	0.54
C.V	9.16	0.92	0.19	3.98	9.17	10.67	3.31

Conclusion

The results from the present investigation concluded that Bottle gourd Genotype AVT-II/2019/BOGVAR-6 was recorded maximum number of female flowers (15.66), vine length (221.33 cm), number of fruits per plant(8.88fruits), average yield per plant (5.71kg/plant), average yield per hectare (342.44 q/ha), and maximum Benefit Cost ratio (4.6) which was found more productive and economically viable.

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