Plant Archives Vol. 17 No. 2, 2017 pp. 1734-1738 *ISSN 0972-5210*

PERFORMANCE OF AMARANTHUS GENOTYPES UNDER LUCKNOW CONDITIONS

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Abstract

A field experiment was carried out entitled "Performance of Amaranthus genotypes under Lucknow conditions" in Randomized Block Design with three replications. The experiment was conducted at the Horticulture Research Farm of the Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Vidya-Vihar, Rae Bareli Road, Lucknow (U.P.), India during *Rabi* season of 2016. The experiment comprises of 50 diverse genotypes. Overall greater performance under Lucknow conditions Pusa Lal Chauli is significantly superior in different characters of growth, yield and quality *i.e.* plant height (149.38 cm), stem width (56.55 cm), number of leaves/plant(182.77), number of branch/plant (13.88), weight of green leaves/plant (153.88 g) dry leaves/plant(11.07 g), width of mid leaves (3.63cm), number of spikes/plant (8.22), 1000 seed weight (1.49 g), yield/plant (2003.33 g), beta carotene (4655.5 mg/100g), vitamin-C (150.1mg/100g) and protein (3.4%).

Key words : Performance, amaranthus, growth, yield and quality.

Introduction

Amaranthus is most common leafy vegetable grown during summer and rainy seasons in India. Rapid growth, quick regeneration after each harvest and high yielding capacity per unit area in given time and high nutritive value are important characteristics of amaranthus. Its leaves and tender stems are rich source of protein, minerals, calcium, iron, folic acid, vitamin A and C. It is one of the cheapest leafy vegetable in tropical and subtropical parts of the country. There are about eight different species of amaranthus is cultivation and out of which *Amaranthus blitum* and *Amaranthus tricolor* are most common. Amaranthus belongs to family Amaranthaceae and have more than 60 species. In India, *A. blitum* and *A. tricolor* are mainly grown and known as chhoti chauli and badi chauli, respectively. Amaranthus can be sown throughout the year except in May-June in northern plains whereas, in Southern India, it is sown throughout the year. The first cutting of leaves can be taken about 25 to 30 days after sowing. Amaranthus is harvested either by pulling whole plant at tender stage or by cutting the plant leaves to 2 cm from the ground level. Subsequent harvestings can be made 8-10 days intervals, with each cutting made at slightly higher than the previous level cut. Normally, 6 to 8 cuttings are possible till the crop starts flowering or becomes unfit for consumption. Amaranthus contains high nutrition value and vegetable amaranthus has losses in any crop improvement programme with the knowledge of the extent of genetic variability that exists among accessions of a species. So, a number of amaranth genotypes have been introduced and acclimatized in respective environment, but the systematic evaluation for these genotypes has not been conducted. Improvement of vegetable amaranthus requires in depth knowledge of the magnitude of variation present in the available germplasms and the relative degree by which a character is transmitted from parent to offspring. The colour of the leaves ranges from purple and red to gold. Its importance has grown due to nutritional and functional properties, resistance to drought and short production time. The amaranthus plant in addition to its high nutritive value and neutraceutical properties has excellent agronomic features. Amaranthus is a versatile plant since it can grow under a broad range of climate, soil and cultivar systems (Bertoni, 1999). This makes amaranthus suitable for both small and big scale

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production systems. It has been estimated that amaranthus leaves have similar nutritional composition than green leafy plants such as spinach and many others (Mujica and Berti, 1997). The most valuable characteristic of amaranthus seeds and dry leaves may be that they contain a high proportion of high quality protein. Leaf protein content and nutritional value including that of carotenoids and minerals are considered as the most important quality parameters in vegetables particularly in amaranthus. Amaranthus grain is expanding as new products are being developed with amaranth as a nutritional ingredient. The young leaves of the ornamental amaranthus Celosia spp., which still belong to the family Amaranthaceae (Grubben, 1976) are highly appreciated for human consumption in many African countries (Olaniyi and Ojetayo, 2012). Antioxidants have been defined as substances that prevent the formation of ROS or other oxidants, scavenge them or repair the damage they cause (Halliwell, 1995).

Materials and Methods

The present experiment entitled "Performance of Amaranthus genotypes under Lucknow conditions" was conducted at Horticulture Research Farm of Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Lucknow of 2016. The experiment was conducted during *Rabi* season under Randomized Block Design with three replications. The experimental materials selected for the present study of variability of 50 amaranthus genotypes *e.g.* Pusa Badi chauli, Pusa Chotti chauli, Pusa Kirti, Pusa Kiran, Pusa Lal Chauli, Arka Suguna, Arka Arunima, Katuwa Sag, Lal Sag, Co-2, VRAM-1, VRAM-4, VRAM-6, VRAM-7, VRAM-8, VRAM-9, VRAM-10, VRAM-11, VRAM-12, VRAM-13, IC-35484, IC-35537, IC-35540, IC-35573, IC-35722, IC-35745, IC-35771, IC-37158, IC-37316, IC-37320, IC-38037, IC-38052, IC-38119, IC-38124, IC-38134, IC-38155, IC-38172, IC-38187, IC-38191, IC-38230, IC-38242, IC-38247, IC-38251, IC-38312, IC-38323, IC-38329, IC-38333, IC-38353, IC-38434 and IC-38445. The observations were recorded for 13 characters *viz*. plant height (cm), stem width (cm), number of leaves/plant, number of branch/ plant, weight of green leaves/plant(g), dry leaves/ plant(g), width of mid leaves (cm), number of spikes/plant, 1000 seed weight(g), yield/plant (g), beta carotene (mg/100g), vitamin C (mg/100g) and protein (%) were recorded by A. O. A. C. (1980), Sagar and Samaul (2005) and Saini *et al*. (2001).

Results and Discussion

Data from table 1 revealed that the differences with respect to the growth, yield and quality were significant among different amaranthus genotypes. Maximum plant height was noted under Pusa Lal Chauli (149.38 cm) followed by Pusa Kiran (121.38 cm) (Maughan *et al*., 2011). Amaranths exhibit C_4 photosynthesis and grow rapidly under heat and drought stress and they tolerate a variety of unfavourable abiotic conditions, including high salinity, acidity, or alkalinity, making them uniquely suited for subsistence agriculture. By implication, amaranth has the potential for significant impact on malnutrition. Maximum stem width was observed under Pusa Lal Chauli (56.55 cm) followed by Pusa Kiran (55.75 cm) (Mohler and Callaway, 1995). Seed production varies enormously with growing conditions. Seed production per plant could be estimated from plant height and basal stem diameter. Number of leaves per plant was recorded under Pusa Lal Chauli (182.77cm) followed by Pusa Kiran (180.77cm) (Maundu *et al*., 2009). The continent is rich of vegetable species including amaranths, which are among the most popular leafy vegetables on the continent. Number of branch per plant was noted under Pusa Lal Chauli (13.88) followed by Pusa Kiran (12.22). (Costea and Tardif, 2003).

The cymes are further arranged in numerous spikes that grow acropetally by the addition of new cymes. At any moment during flowering, toward the endings of the spisiform branches there are several newly developed male flowers that can pollinate female flowers from lower cymes. Weight of green leaves per plant was observed under Pusa Lal Chauli (153.88) followed by Pusa Kiran (150.66) (Mohler and Callaway, 1995). The size and weight of the seeds can vary between the populations of the same species, between the individuals of the same populations and even between seeds on the same plant. Dry leaves per plant was recorded under Pusa Lal Chauli (11.07 g) followed by Pusa Kiran (10.33 g).Width of mid leaves was noted under Pusa Lal Chauli (3.63) followed by IC-38434 (2.96).Number of spikes per plant was observed under Pusa Lal Chauli (8.22) followed by Pusa Kiran (7.66).1000 seed weight was recorded under Pusa Lal Chauli (1.49 g) followed by Pusa Kiran (1.43 g). Yield per plant was noted under Pusa Lal Chauli (2003.33 g) followed by Pusa Kiran (1896.67 g) Beta carotene was observed under Pusa Lal Chauli (4655.5) followed by Pusa Kiran (4550.1).Vitamin C was recorded under Pusa Lal Chauli (150.1 mg/ 100g) followed by IC-38333(145.3 mg/100g) and protein was noted under Pusa Lal Chauli (3.4%) followed by IC-38353 (3.2%).

Conclusion

The results of this study significantly superior Pusa Lal Chauli overall greater performance all genotypes

Table 1 : Performance study of Amaranths genotypes under Lucknow condition.

Varieties	Plant height (cm)	Stem width (cm)	Number of leaves /plant	Number of branch /plant	Weight of green leaves/ plant(g)	Dry leaves/ plant(g)	Width of mid leaves (cm)	Number of spikes /plant	1000 seed weight(g)	Yield/ plant (g)	Beta carotene (mg/100g)	Vitamin C(mg/ 100g)	Protein (%)
Pusa Badi chauli	36.66	22.26	65.99	7.63	47.33	4.86	1.01	3.44	1.03	926.66	3500.8	125.3	2.1
Pusa Chotti chauli	37.61	9.49	25.55	5.22	12.77	2.45	1.08	5.37	1.07	1500.89	4020.5	124.5	2.9
Pusa Kirti	103.86	36.30	35.22	5.44	60.77	5.167	0.29	4.73	1.01	1056.93	4200.6	120.4	2.8
Pusa Kiran	121.38	55.75	180.77	12.22	150.66	10.33	2.55	7.66	1.43	1896.67	4550.1	145.2	3.1
Pusa Lal Chauli	149.38	56.55	182.77	13.88	153.88	11.07	3.63	8.22	1.49	2003.33	4655.5	150.1	3.4
Arka Suguna	44.01	17.48	41.66	5.33	62.56	2.89	0.37	4.22	1.06	133.33	2010.5	110.3	2.1
Arka Arunima	47.98	11.97	41.55	6.33	41.67	2.47	0.54	3.44	1.07	753.33	3800.0	100.4	2.0
Katuwa Sag	105.04	39.95	120.22	8.22	109.33	6.43	1.11	6.03	1.09	1516.67	2912.3	112.8	2.2
Lal Sag	38.86	20.16	50.11	5.89	85.33	3.71	1.05	5.97	1.03	967.33	3605.0	125.8	2.1
Co-2	35.83	19.23	42.88	2.88	97.67	4.27	1.01	3.33	1.02	927.67	4021.6	135.5	1.9
VRAM-1	45.87	24.91	34.44	4.90	71.11	5.49	0.67	2.22	1.06	956.67	3005.2	122.5	2.0
VRAM-4	47.40	26.35	41.66	1.77	48.33	4.73	1.01	4.22	1.01	1473.33	1820.6	098.0	2.5
VRAM-6	52.54	27.97	20.22	4.33	38.33	4.22	0.31	5.63	1.02	203.33	2654.3	113.5	2.4
VRAM-7	50.44	24.28	43.33	1.33	43.33	4.66	0.87	2.55	1.06	613.33	3782.7	095.4	1.8
VRAM-8	49.70	24.56	32.77	4.88	45.78	5.19	1.06	3.99	1.04	970	2531.5	101.7	2.0
VRAM-9	54.97	25.38	33.66	7.22	46.67	4.84	0.98	5.44	1.06	666.67	2900.4	095.6	2.4
VRAM-10	51.61	24.48	32.55	4.11	45.56	5.28	1.07	4.22	1.01	93.33	2600.7	123.5	2.6
VRAM-11	48.89	23.68	21	4.44	47.78	5.149	1.09	4.99	1.02	1030	2587.6	103.8	2.4
VRAM-12	49.34	28.01	29.33	4.11	48.89	4.68	0.64	5.55	1.07	1463.38	1456.5	105.2	2.3
VRAM-13	51.93	25.67	27.33	4.11	47.77	5.52	0.37	4.73	1.08	473.33	2568.4	106.3	2.2
IC-35484	36.8	21.73	60.66	7.33	46.67	4.97	1.02	0.33	1.04	894.33	3265.1	107.4	2.1
IC-35537	34.16	19.62	25.33	5.68	13.33	2.73	1.08	4.66	1.01	1506	1982.5	108.5	2.8
IC-35540	104.68	34.19	35.33	5.67	60.67	4.07	0.24	4.67	1.07	1176.67	2586.4	109.5	2.6
IC-35573	102.90	32.78	119.33	6.66	107.46	3.73	1.05	5.66	1.03	1013.33	3546.1	124.6	2.1
IC-35722	101.4	27.55	101.66	6.33	50.34	4.03	0.29	3.98	1.02	1237	2564.3	095.4	1.8
IC-35745	47.03	24.08	49.66	5.33	60.33	2.96	1.03	4.66	0.04	133.33	2832.5	098.7	1.9
IC-35771	44.76	12.86	37.66	5.66	43.33	2.89	0.94	5.66	0.33	673.33	1654.4	120.4	3.0
IC-37158	46.56	14.18	55	5.34	40.57	3.69	0.34	3.66	1.02	1500	2013.4	113.6	2.8
IC-37316	42.03	20.37	20.33	4.66	81.66	4.33	0.27	5.66	0.67	876.67	3654.2	123.1	2.5
IC-37320	38.10	18.37	48.33	4.45	103.33	5.27	1.07	1.33	0.59	853.33	4203.1	124.5	2.6
IC-38037	40.46	21.32	29.33	3.66	56.67	5.47	0.83	5.45	0.27	880	4002.5	126.1	2.4

Table 1 continued....

Table 1 continued....

IC-38052	119.56	43.3	141.66	11.76	141.67	8.47	1.47	6.48	1.36	1883.33	4450.2	105.7	2.3
IC-38119	50.66	23.86	19	2.66	35.67	4.97	1.03	4.68	0.63	170	2354.2	104.32	2.1
IC-38124	54.30	22.97	40.33	1.67	40.56	4.49	0.76	5.33	1.03	620	2531.1	107.5	2.0
IC-38134	51.73	23.46	32.33	4.66	43.33	5.37	1.07	3.78	0.23	1170	3264.3	134.0	2.2
IC-38155	58.36	21.28	38.66	6.43	51.66	4.43	0.48	5.89	1.07	896.67	4561.2	125.8	2.3
IC-38172	48.23	26.05	36.33	3.33	46.66	5.93	0.17	2.56	0.57	1508.67	2365.4	136.4	2.4
IC-38187	46.5	23.91	24	4.45	48.33	5.13	1.03	3.66	1.08	1109.07	2546.1	129.1	2.6
IC-38191	49.23	22.69	27.66	4.97	50.78	4.47	1.06	4.34	1.03	1401.67	4210.4	134.5	2.8
IC-38230	53.6	21.35	27.33	3.33	43.33	5.57	0.47	5.33	0.39	1170	4100.2	127.9	2.1
IC-38242	34.03	15.03	33.33	7.56	48.67	4.3	1.08	0.33	1.01	118.33	3856.4	117.8	2.6
IC-38247	31.6	24.93	26	5.33	11.66	2.81	0.73	4.66	1.07	670	2647.5	095.9	2.5
IC-38251	102.98	38.64	37.33	6.38	63	5.65	0.17	3.66	0.47	1288.33	3256.4	097.5	1.9
IC-38312	103.26	32.67	108	7.66	103.33	4.87	0.72	5.66	1.05	883.33	3334.2	101.4	2.0
IC-38323	98.67	19.19	106.66	6.66	55.56	5.46	1.02	5.33	1.01	786.67	2786.1	117.2	2.8
IC-38329	44.53	11.59	37.33	5.66	62.33	2.87	1.09	3.67	0.61	903.33	2569.4	127.8	2.9
IC-38333	110.23	42.65	140.66	9.38	132.33	7.92	1.27	6.25	1.28	1878.33	3457.0	145.3	3.0
IC-38353	49.10	17.89	53.66	5.68	41.67	4.27	1.11	5.33	1.03	163.33	3654.2	094.2	3.2
IC-38434	36.73	25.27	59.33	5.68	86.67	5.13	2.96	4.23	0.42	643.33	3756.7	097.5	2.9
IC-38445	36.90	23.87	49	2.64	100.98	3.29	1.43	0.66	1.04	1180	4102.5	134.0	2.8
SEM+-	**1.85**	**104.22**	**6.13**	**0.44**	**3.00**	**0.316**	**0.245**	**0.658**	**0.075**	**252.86**	**0.241**	**0.66**	**0.078**
CD	**5.317**	**NS**	**17.64**	**1.26**	**8.6**	**0.908**	**0.705**	**1.89**	**0.215**	**87.98**	**0.70**	**1.92**	**0.221**

under Lucknow conditions was conducted at Horticulture Research Farm of Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Lucknow.

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