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Plant Growth and Yield as Influenced by the Grain Amaranthus (*Amaranthus hypochondriacus*) Genotypes under Northwest Himalayan Conditions

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ABSTRACT

Nine genotypes of grain amaranthus (*Amaranthus hypochondriacus)* were evaluated for nine characters to evaluate field performance. Experiments were conducted at G.B. Pant University of Agriculture and Technology, Hill Campus, Ranichauri, Tehri Garhwal, Uttarakhand during *kharif* 2011 and 2012. The results revealed that, the genotype Durga followed by IC35468 showed minimum days to 50% flowering during both years and Durga was found to be best for the character days to maturity having minimum days. The highest yield was recorded by PRA 2010-1 followed by PRA3, however, genotype PRA3 showed stability for many characters like germination per-cent, Days to 50% flowering, Spikelets as well as inflorescence length and can be used for improvement of these traits in breeding programme. Genotype PRA2010-1 performed better for almost all the characters over checks.

Introduction

Amaranthus hypochondriacus is widely cultivated as ornamental, pseudo-cereal, and fodder crops in many tropical to warm-temperate regions of the world (6). In India the species is extensively cultivated as subsidiary food crop from Kashmir to Arunachal Pradesh. Amaranth grain has protein is of an unusually high quality (high in the amino acid lysine 5.0 to 6.0 % and also rich in the sulphur-containing amino acids) confirms its high potential for use in both human and animal nutrition and also shows high promise for supplementing nutritive food and amelioration of protein deficiency strictly in the vegetarian diet people. The genetic reconstruction of a plant type is required for developing high yielding varieties by incorporating and improving yield components (4). Hence, the knowledge on genetic parameters within the available genotypes is a prerequisite for effective selection and development of superior varieties. So, the present studies were undertaken for evaluation of different genotypes of grain amaranth for estimation of plant growth, yield and yield contributing characters.

Materials And Methods

Present experimental was comprised of nine diverse genotypes of grain amaranth species (*Amaranthus spp*.) including three checks named Annapurna, Durga and PRA3. The experiment was conducted in the Complete Randomized Block Design (CRBD) during *kharif* season 2011 and 2012 under rainfed condition in three replications. On the basis of visual observation germination percentage in field was recorded. The number of days required to 50% flowering was recorded in each entry in all three replications. Plant height was recorded at the time of maturity of 10 randomly selected plants from the ground level to tip of the top most spike. The thickness of stem was measured with the help of vernier caliper. The number of spikelets present in inflorescence and spikelet length was measured across the tip to base of longest spikelet from 10 randomly selected plants in each entry in the three replications. 10 ml seed weight (g) and seed yield (q ha^{-1}) were recorded in 10 randomly selected plants of all three replications of each genotype. The number of days required to maturity was recorded in each entry in all three replications. The statistical analysis for all the characters studied was done by the method recommended by Cochran and Cox (1959).

Results And Discussion

In present experiment, the analysis of variance showed significant variation in all the characters studied in both the years. During both the years, maximum germination per-cent was recorded for genotypes Durga and PRA-3. Genotype Durga followed by IC35468 showed minimum days to 50% flowering during both the years. During first year PRA 2010-3 was best for plant height but during second year PRA-3 was found to best. Number of spikelets per plant were reported maximum for genotype PRA 2010-1 during first year but during second year these were maximum for genotype IC35468. Maximum spikelet length was reported for genotype IC042323 during both years. Durga was found to be best for the character days to maturity having minimum days in both the years. All the genotypes showed no significant difference for the character 10 ml seed weight. The highest yield was recorded by PRA 2010-1 followed by PRA3 during first year and second year.

There was a significant decline in values of almost all the characters during second year in comparision to first year due to adverse environmental conditions arising from heavy rainfall in second year. A significant difference for environments as well as for G × E interaction for yield and its component traits has been observed by many workers previously in grain amaranthus (1, 2, 3, 5, 7, 8, 9). Genotype PRA3 showed stability for many characters like germination per-cent, Days to 50% flowering, Spikelet length and Inflorescence length during both years and can be further used as stable genotypes for these characters. The pooled mean of two years for grain yield was highest for genotype PRA2010-1 followed by PRA3 and PRA2010-3. Genotype PRA2010-1 performed better for almost all the characters during both the years over checks. So this genotype can be used as a potential genetic source for the improvement of breeding program under these conditions.

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Table: Performance of different grain amaranthus genotypes during *kharif* 2011 and 2012

s.no.	Genotype	Germination%		Days to 50% flowering (days)		Plant height (cm)		No. of spikelets per plant		Spikelet length (cm)		Inflorescence length (cm)		Days to maturity		10ml seed weight (g)		Seed yield (qtl/ha)	
		2011	2012	2011	2012	2o11	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
1	IC042323	61.00	83.66	80.33	86.00	115.0	115.8	39.33	48.00	13.47	15.61	42.67	51.33	143.0	145.3	12.17	11.56	5.75	10.49
2	IC42328	51.33	86.33	89.33	84.66	118.8	122.1	38.66	46.33	11.74	12.61	49.13	54.33	149.6	154.3	12.06	11.77	5.17	10.92
3	IC35468	46.66	88.66	68.33	58.00	115.5	166.4	41.66	52.00	9.53	11.86	53.60	60.00	127.0	133.3	11.97	11.80	6.80	12.05
4	PRA2010-1	81.66	89.33	80.33	67.00	117.9	180.2	49.66	48.00	13.14	13.46	60.41	58.53	152.3	145.3	11.80	11.88	9.41	17.83
5	PRA2010-2	79.33	82.66	91.33	65.33	97.5	136.2	39.66	35.67	10.45	10.23	38.29	46.60	158.6	156.3	11.56	11.58	9.09	16.56
6	PR2010-3	62.33	64.66	92.00	67.33	82.8	183.8	44.00	43.33	12.29	12.43	44.68	43.26	154.0	158.3	11.67	11.68	9.61	16.43
7	ANNA PURNA	80.33	80.66	84.33	69.33	91.8	173.7	37.00	27.00	13.15	13.46	49.36	40.20	136.0	149.3	11.90	11.93	8.64	15.22
8	DURGA	83.66	89.66	68.00	49.66	113.8	155.0	43.33	31.67	10.49	13.26	43.00	46.70	120.0	133.0	12.10	11.75	8.43	14.68
9	PRA-3	89.00	89.66	87.66	84.33	124.2	152.4	26.66	43.00	12.12	13.53	46.18	50.06	149.3	157.6	12.10	11.90	9.24	17.53
Range		51.33-89.00	64.66-89.66	68.00-92.00	49.66-86.00	82.8-124.2	115.8-183.8	26.66-49.66	27.00-52.00	9.53-13.47	10.23-15.61	38.29-60.41	40.20-60.00	120.0-158.6	133.0-158.3	11.56-12.17	11.5-11.9	6.80-9.61	10.49-17.83
GM		70.59	83.92	82.40	70.18	108.6	154	40.00	41.66	11.82	12.94	47.48	50.11	143	148.1	11.92	11.76	8.02	14.64
SEM		2.13	0.72	1.71	0.62	3.70	4.02	0.65	2.00	0.33	0.55	0.37	1.28	0.96	4.08	0.19	0.10	0.33	0.57
CD		6.39	2.17	5.12	1.88	11.1	12.07	1.96	6.00	1.01	1.66	1.11	3.86	2.88	12.2	0.57	0.30	0.99	1.73
CV		5.26	1.49	3.59	1.55	5.91	4.53	2.84	8.32	4.95	7.41	1.35	4.45	1.16	4.77	2.8	1.50	7.17	6.85

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