Studies on characterization of qualitative and morphological traits of grain amaranth (*Amaranthus hypochondriachus* L)

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ABSTRACT

Grain amaranth (*Amaranthus hypochondriachus* L) is a potential crop that exhibits a high degree of qualitative and morphological diversity. Twenty four genotypes of amaranth along with 4 checks viz GA-2, Suvarna, BGA-2 and CG Rajgira-1 were identified in the study area. Genotypes were characterized by infra-specific variations on the basis of qualitative characters. They showed green, reddish green, yellow green, pink and creamy coloured appearances with some of the differences in colours of leaves, stem, petioles, inflorescence and seeds. Significant differences for morphological traits showed high coefficient of variation for seed yield per plant, number of branches per plant, lateral spikelets length, inflorescence width and stem thickness. This information may prove benefical in the present era for protecting the unique grain amaranth.

Keywords: Grain amaranth; qualitative traits; morphological traits, genotypes, variations

INTRODUCTION

Grain amaranth is suitable for nutritional and functional properties but there are only few characterization studies on this aspect. The accurate information about statistics on acreage and production of grain amaranth in India is not known. However hand-harvested yields were high ie 1,200 kg/ha in India (Dua et al 2013). Grain amaranth has very wide variation in leaf size, leaf shape, branching, flowering pattern, flower colour and seed colour (Khurana et al 2013). Its leaves and seeds are very good source of vitamins and lysine. Qualitative characters are considered as morphological markers in identification of genotypes because they are less influenced by environmental factors.

METHODOLOGY

Twenty four genotypes including 4 checks were obtained from different states like Gujrat, Jharkhand, Rajasthan, Odisha and Chhattisgarh. The experiment was conducted at main campus Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. All genotypes were grown in randomized block design with 3 replications during rabi season of 2019-2020. Each plot consisted of 4 rows of 3 m length and spacing between row to row was 45 cm. Recommended package of practices was followed to raise the crop. Observations on 5 plants were recorded for qualitative and morphological characters from each replication. The mean, range and coefficient of variation were estimated by standard methods.

RESULTS and DISCUSSION

Qualitative characterization

Colour is an important factor in separating commercial varieties from the genotypes. Among all the genotypes, 4 check varieties (GA-2, Suvarna, BGA-2 , RMA-7 and CG Rajgira-1) exhibited sufficient variability (Table 1). Sixteen genotypes were found having green colour of leaves with RMA-7 and CG Rajgira-1 while 8 genotypes showed redish green and yellow green with GA-2 and BGA-2. Colour of stem was green in 12 genotypes with Suvarna and CG Rajgira-1 and others were pink coloured with GA-2 and BGA-2. Green colour of petioles was found in 12 genotypes with Suvarna, RMA-7 and CG Rajgira-1 while rest of the genotypes showed pink colour with

Table 1. Qualitative characters of grain amaranth genotypes

Genotype	Colour				
	Leaf	Stem	Petiole	Inflorescence	Seed
SKPGA-150	Green	Green	Green	Green	Cream
SKPGA-155	Green	Green	Green	Green	Cream
SKNA-1305	Green	Pink	Pink	Pink	Yellow
SKNA-1313	Green	Green	Green	Green	Yellow
SKNA-1406	Green	Green	Green	Green	Yellow
SKNA-1407	Green	Green	Green	Green	Yellow
CGA 18-1	Reddish green	Pink	Pink	Pink	Cream
CGA 18-2	Reddish green	Pink	Pink	Pink	Cream
KBGA-7	Reddish green	Pink	Pink	Pink	Yellow
RGA 12-22	Green	Pink	Pink	Pink	Cream
RGA 13-3	Green	Green	Green	Pink	Cream
BGA-4	Green	Green	Green	Pink	Yellow
BGA 7-1	Green	Green	Green	Pink	Yellow
BGA-9	Green	Green	Green	Pink	Yellow
BGA-10	Reddish green	Pink	Pink	Pink	Yellow
BGA 14-3	Reddish green	Pink	Pink	Pink	Yellow
BGA-16	Green	Pink	Pink	Pink	Yellow
BGA-17	Green	Pink	Pink	Pink	Yellow
BGA-20	Green	Pink	Pink	Pink	Yellow
GA-2 (check)	Yellow green	Pink	Pink	Pink	Yellow
Suvarna (check)	Yellow green	Green	Green	Green	Cream
BGA-2 (check)	Yellow green	Pink	Pink	Pink	Yellow
RMA-7 (check)	Green	Green	Green	Green	Yellow
CG Rajgira-1 (check)	Green	Green	Green	Green	Cream

Table 2. Descriptive statistics of quantitative characters of 24 grain amaranth genotypes

Character	Mean	Coefficient of variation	Range	
			Min	Max
Days to 50% flowering	73.15	1.16	66.90	81.78
Days to maturity	142.86	0.46	131.90	147.15
Plant height (cm)	178.02	1.46	136.77	205.63
Stem thickness (cm)	6.02	2.35	4.67	7.20
Inflorescence length (cm)	70.80	2.36	44.47	81.23
Inflorescence width (cm)	15.41	2.72	11.87	28.13
Leaf length (cm)	30.89	1.55	26.50	34.30
Petiole length (cm)	18.66	1.54	16.10	20.87
Lateral spikelets length (cm)	29.18	3.12	20.28	36.50
Number of branches/plant	19.24	3.15	14.10	24.10
10-ml volume seed weight (g)	5.14	1.52	4.43	6.33
Seed yield/plant (g)	15.15	6.47	9.83	24.13

BGA-2. Inflorescence colour was exhibited green in 18 genotypes with Suvrana, RMA-7 and CG Rajgira-1 and other genotypes were found pink coloured with BGA-2. Colour of seeds was shown in 16 genotypes with GA-2, BGA-2 and RMA-7 and rest of the genotypes indicated cream with CG Rajgira-1. Colour of seed was exhibited in 16 genotypes with GA-2, BGA-2 and RMA-7 and others showed creaminess with CG Rajgira-1.

Morphological characterization

The summary of description of all the 12 morphologial characters is given in Table 2. Significant differences among the genotypes showed broad variability. High coefficient of variation was observed for seed yield per plant (6.47), number of branches per plant (3.15), lateral spikelets length (3.12), inflorescence width (2.72), inflorescence length (2.36) and stem thickness (2.35).

Days to 50 per cent flowering ranged between 66.9-81.78 days with mean value of 73.15 days. Days to maturity varied 131.9-147.15 days with mean value of 142.86 days. Plant height was 136.77-205.63 cm with mean value of 178.02 cm. Stem thickness ranged between 4.67 and 7.20 cm with mean value of 6.02 cm. Inflorescence length and width ranged from 44.47 to 81.23 and 11.87 to 28.13 cm respectively. Leaf length was from 26.50 to 34.30 cm with mean value of 30.89 cm. Petiole length ranged from 16.10 to 20.87 cm with mean value of 18.66 cm. Lateral spikelets length was from 20.28 to 36.50 cm with mean value of 29.18 cm. The number of branches per plant was14.10 to 24.10 with mean value of 19.24. Weight of ten-ml volume seed weight varied from 4.43 to 6.33 g with mean value of 5.14 g. Seed yield per plant ranged from 9.83 to 24.13 g with mean value of 15.15 g. The present results are contrary to the finding of Akin-Idowu et al (2016) excect plant height, stem diameter and seed yield per plant.

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