

Studies on variation in relation to different stages of growth in Amaranthus

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ABSTRACT

To elicit information on the variability studies of amaranthus field experiments were conducted at Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal during June 2003 to January 2004, to understand the mean performance of seventy four amaranthus genotypes at five stage of harvest along with the extend of variability of different quantitative and quality characters in relation to yield were studied. The yield increases are attributed to augmentation of yield components like plant height, leaf length, leaf breadth, petiole length, number of leaves pr plant, branches per plant, stem girth. An overall analysis of the growth pattern an weight of leaves and components characters indicated that the optimum stage for harvest was between stage S32 to S3, i.e. 30 to 45 days after sowing. Among the different growth stages, the iron content was found to be high at S3 stage. Quality parameter especially calcium, protein and crude fibre content of the genotypes showing superior quality at S3 stage and thereupon it starts declined. The anti nutritional factor like oxalate showed increased trend up to S3 stage and declined thereupon. The low oxalate content of the genotype can be used for introducing new cultivars with high yield with low oxalate content.

Key Words : Variability, Quantitative, Qualitative, Growth pattern, Genotypes, Anti-nutritional, Variation, Superior genotypes, Acceptability, Quality content, High yield, Low oxalate, Content.

INTRODUCTION

Amaranthus belongs to family Amaranthaceae and having a chromosome number $2n = 34$, order Caryophyllales comprises about 800 species in 60 genera of herbaceous annual plant, rarely shrub. Amaranthus is the most delicious leafy vegetable of tropical, sub tropical and temperate regions of the world and it also grown an important grain crop of Himalayan region as reported by (Joshi and Rana, 1991).

In any crop improvement programme, assessment of variability in the germplasm is a preliminary step, which will help in the selection of types showing high variability for the desirable characters that contribute to yield. Yield being a complex character, is influenced by different component characters and an understanding of the magnitude and directions of associations between yield and its component traits will help in fixing the selection criteria with selection of better genotypes. Very few studies have been made in this aspect in amaranthus. So the present studies were carried out in different stages in relation to growth of amaranthus. The characters viz., weight of leaves, yield of greens, stem weight, plant weight and leaf stem ratio had high variability in relation to different growth stages and these suggests that they may possibly controlled by additive genes and theses characters can be used for improvement of yield in amaranthus by selection method. An overall analysis of growth pattern for yield of greens and components characters conclusively indicated the optimum harvest stage as 30 to 45 days after sowing. The progression in yield of greens and weight of leaves observed from stage 1 to stage 5 where leaf stem ratio should lesser magnitude in stage 4. Optimum leaf stem ratio around 0.85 has to aimed for selection.

MATERIALS AND METHODS

The investigation were carried out at the experimental farm of college orchard in the Department of Horticulture, Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal during June – 2003 to January- 2004. Seventy-four genotypes of amaranthus were utilized for the study in randomized block design with two replications. The genotypes were raised in beds of 1 m x 1 m with five lines in each bed, spaced at 15cm and in each line the seed were closely dibbled. A uniform population in each accession was ensured that the number of plants in each bed five plants in each replication were pulled out randomly at different stages of

harvest 15 (S1), 30 (S2), 45(S3), 60(S4) and 75 (S5) days after sowing for recording observation on quantitative and qualitative characters. The variability in relation to breeding for high yielding varieties has obvious importance as evidenced by earlier workers like Snedecor and Cochran (1967).

RESULTS AND DISCUSSION

All the characters showed quantum increase in the mean values on the successive stages of harvest except leaf stem ratio which showed decreasing trend after S3 stage (45 days after sowing) An overall analysis of the growth pattern taking with account of the yield of greens and component characters indicated the harvesting between S2 to S3 stage be optimum to get high yield of greens with good acceptability. Plant height and leaf length is considered as one of the traits for growth and vigour of the plants. In the present investigation, the genotypes exhibited significant differences for plant height at different stages of growth. These findings were line with Mohanalakshmi *et al* (1994), Pratap Reddy and Varalakshmi (1998). Leaf breadth of different stages of growth gradually increased and found to be important yield contributing characters of amaranthus. This was supported by Prakash *et al*. (1993). Petiole length is one of the important component characters of amaranthus, larger petiole length exhibits more number of leaves in the stem. The genotypes showed higher stem girth take into account for further improvement work for high stem yield with leaf as thandukerrai. A similar results obtained by Mohanalakshmi, *et al* (1994). Number of leaves per plant is an important yield contributing traits in amaranthus. The number of leaves per plant at different growth were gradually increase and found to be maximum quality will be obtained at S2 to S3 stage, and this was found to be optimum stage of growth with good acceptability. These findings were supported by Pratap Reddy and Varalakshmi (1991). Branches per plant is an important character which contribute the yield of green, when the branches were more ultimately the yield of greens increased accordingly and found to optimum at S3 stage these studies in relation to Lohithaswa *et al*. (1996). Yield of greens is important character contributes for stem yield (thandukeerai) and leafy yield (mulaikerai) in amaranthus and higher yield of greens with stem yield can be better for thandukeerai. These results were confirmed by the earlier findings of Mohanalakshmi *et al*. (1994), Varalakshmi and Pratap Reddy (1994) in amaranthus.

Tabel 1.Variability in morphological traits of amaranthus

Charaters	S1			S2			S3			S4			S5		
	Range	Mean	C.D	Range	Mean	C.D	Range	Mean	C.D	Range	Mean	C.D	Range	Mean	C.D
Plant height (cm)	6.06-20.73	13.39	3.44	23.90-82.40	53.16	22.08	37.53-149.90	93.62	10.14	81.26-176.51	128.88	15.25	71.70-210.21	140.95	49.47
Leaf length (cm)	1.67-4.79	3.20	1.21	6.17-13.45	9.81	4.70	7.93-15.26	11.59	2.90	8.37-10.75	12.68	3.81	11.05-22.04	16.54	3.71
Leaf breadth (cm)	1.12-5.83	3.47	0.77	3.51-7.95	5.73	1.98	4.11-9.80	6.95	2.58	5.50-10.75	8.12	2.58	6.50-13.20	9.85	3.54
Petiole length (cm)	1.35-4.03	2.69	0.58	3.38-7.50	5.44	1.99	4.23-8.36	6.29	2.03	6.05-9.85	7.95	2.21	6.50-11.65	9.07	3.15
Stem girth	1.17-1.91	1.54	0.23	2.07-3.42	2.74	0.41	3.11-5.78	4.44	0.88	4.29-7.40	5.84	0.90	4.29-9.06	6.67	1.11
Number of leaves	6.90-15.00	10.95	2.27	11.70-65.30	38.50	8.06	20.30-95.00	57.65	15.66	31.00-120.00	75.50	21.80	33.10-203.50	118.30	12.25
Branches per plant	1.95-14.00	7.97	2.98	4.00-13.50	8.75	3.11	5.45-16.90	11.17	3.67	7.90-18.50	13.20	3.45	10.00-32.00	21.25	4.46
Weight of leaves (g)	1.60-66.60	28.55	0.53	2.65-19.95	11.30	2.01	3.96-29.30	16.63	4.35	7.44-52.65	30.04	6.40	8.68-71.50	40.09	7.03
Leaf stem ratio	0.06-0.66	0.36	0.87	0.23-1.42	0.82	4.23	0.29-1.82	1.05	0.85	0.15-1.07	0.61	0.12	0.08-1.05	0.56	0.11
Yield of greens (g)	4.50-47.00	25.75	0.06	9.02-106.60	57.80	0.11	15.57-34.57	75.07	0.05	21.82-147.35	84.58	4.83	32.56-166.74	99.15	2.13

It is an important character, which decides the contribution of genotypes suitable for leafy types as well as thandukeerai. Among the different genotypes studied, maximum leaf stem ratio (1.82) as compared to other genotypes. This result is an agreement with the findings of Mohanalakshmi *et al.* (1994).

QUALITY CHARACTERS

The present study revealed significant differences in quality attributes in different stages of harvest. Amaranthus is being a traditional and popular vegetable in India and Tamil Nadu, it is very much valued for the protein, calcium, iron and crude fibre, the value

because free oxalate bind essential dietary bivalent minerals especially calcium and makes them nutritionally unavailable. Besides calcium oxalate thus formed may accumulate resulting in oxalate or kidney stones. Grubben and Vansloten (1981) are of the view that no adverse effects are to be feared under normal consumption levels of these anti nutrient components will be desirable for safer consumption.

The results of the present study have brought out some useful information of the contents of oxalate and variation in relation to stage of harvest. The oxalate content of different genotypes varies from 0.34 to 0.11. The oxalate content generally increased up to S3

Tabel 2 : Variability in quality traits of amaranthus

Charaters	S1			S2			S3			S4			S5		
	Range	Mean	C.D	Range	Mean	C.D	Range	Mean	C.D	Range	Mean	C.D	Range	Mean	C.D
Total chlorophyll	0.10-1.40	0.70	0.06	0.11-1.49	0.77	0.03	0.20-1.60	0.83	0.01	0.14-1.50	0.72	0.02	0.11-1.32	0.65	0.02
Iron	0.05-0.45	0.22	0.07	0.08-0.46	0.24	0.01	0.09-0.47	0.22	0.08	0.06-0.44	0.20	0.07	0.04-0.42	0.19	0.07
Calcium	0.04-0.32	0.17	0.04	0.05-0.34	0.18	0.02	0.08-0.35	0.31	0.03	0.07-0.31	0.17	0.38	0.06-0.29	0.15	0.18
Crude fibre (%)	4.20-7.80	6.19	0.24	4.40-8.00	6.56	0.06	4.70-8.20	5.75	0.01	4.20-7.30	6.027	0.09	4.20-7.10	6.01	0.04
Protein (%)	7.11-12.25	10.35	0.16	7.16-12.34	10.47	0.10	7.30-12.37	10.33	1.91	7.03-12.12	10.12	0.21	6.95-12.03	9.99	0.22
Oxalate content (%)	0.06-0.91	0.39	0.34	0.07-0.93	0.40	0.16	0.08-0.95	0.41	0.11	0.07-0.94	0.41	0.07	0.06-0.94	0.44	0.49

of which need little over emphasis in human nutrition in the present context of wide spread malnutrition. The study has clearly brought out the varying trend of progression of nutrient over the stages of harvest, it is possible to have the benefit of maximum nutrient content of most of the nutritional attributes by adjusting the stage of harvest. Further for each of the nutritional attributes by adjusting the stage of harvest, different genotypes have been identified. These types will be useful for direct selection or as parents in a hybridization programme. Variation in the content of nutrients in relation to age has been reported by Bassir and Fatunsoa (1975), Grubben (1976), Joel Ehas (1977) and Vijay Kumar and Shanmugavelu (1985), corroborated the results of the present study.

The oxalate content of leafy vegetable including amaranthus need special mention. Despite its high nutritional value, the main constraint to their full exploitation is the presence of anti - nutritional factors viz., oxalate. The oxalate levels in foods are in serious concern

stage (45 Days after sowing) and declined thereupon.

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