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Short communication

Characterization and preliminary evaluation of Vegetable amaranth (*Amaranthus* spp.)

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Amaranth is one of the main species of taxonomically diverse group of tropical leaf vegetables. The nutritional value of amaranth is excellent because of its high content of essential minerals (iron, calcium) and good source of vitamins (ß -carotene, vitamin C and folic acid). Amaranth belongs to the genus Amaranthus of the family Amaranthaceae. Amaranthus has many species which are used as leafy vegetables, e.g. A. tricolour, A. tristis, and A. viridis. It is widely cultivated throughout India especially during the summer and rainy seasons. There was little information on the extent and kind of diversity present in the collection maintained in Hyderabad, hence characterization and preliminary evaluation of these germplasm lines was considered an important area of study.

Thirty-one accessions collected at Vegetable Research Station, APHU, Rajendranagar, Hyderabad were characterized and evaluated during the *kharif* season of 2009–10 at the experimental farm,Vegetable Reseach Station, Rajendranagar, Hyderabad. Each accession was grown in 3m long rows with a spacing of 45 cm between rows and 15 cm within rows, under recommended growing conditions. For characterization, IBPGR descriptor (13 qualitative and 8 quantitative traits) were considered. Qualitative traits studied includes growth habit, branching index, stem pubescence, stem pigmentation, presence of spines in leaf axils, leaf pubescence, leaf pigmentation, leaf shape, prominence of leaf veins, petiole pigmentation, terminal inflorescence shape, terminal inflorescence attitude and inflorescence colour while quantitative traits recorded were plant height, number of branches, leaf length, leaf breadth, petiole length, leaf weight, stem weight and seed yield.The scoring for these characters was done as per the IBPGR Amaranth Descriptor List (Grubben and van Sloten 1981). Data were collected from five randomly selected plants on various quantitative characters .Mean data were subjected to statistical analysis to calculate range, standard deviation and coefficient of variability which were used to group the germplasm into different categories (Panse and Sukhatme, 1978).

With respect to the quantitative traits, the germplasm showed a wide range of variability in plant height (46.0–149.5 cm), number of branches(5.5-20.5), leaf length (10.0-24.5 cm), leaf width (5.2–12.7 cm), petiole length (5.7–12.7 cm) leaf weight per plant (7.0- 119.0g), stem weight per plant (28.0-975.0 g) and seed yield per plant (6.0-58.0 g)indicating the possibility of exploiting this variation for varietal improvement in amaranth. Similarly, Wu *et al.* (2000) reported the presence of wide diversity in agronomic traits among amaranth genotypes and also identified several genotypes having the required agronomic traits for cultivar development.

Among the qualitative characters, all the accessions were erect, with no spines, had a tap root and an erect terminal inflorescence attitude and were monoecious. Other morphological characters exhibited large variability (Table 1). Branches were found all along the stem in almost all the germplasm lines (25) while some branches

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Table 1: Grouping of vegetable amaranth germplasm for qualitative parameters

Character	Category
Branching Index	(a) Branches all over the stem (25), (b) Only at top (4), (c) Only at base (2)
Stem pubescence	(a) None (2), (b) Low (11), (c) Medium (19), (d) Conspicious (5)
Stem pigmentation	(a) Green (10), (b) Green with base pink (19), (c) Purple (10), (d) Green with basal half pink and top half green (1)
Leaf pubescence	(a) Low (14), (b) Medium (13), (c) Conspicous (6)
Leaf pigmentation	(a) Normal green (12), (b) Normal green with margin pigmented (3) (c) Dark green (4), (d) Dark green with margin pigmented (12)
Leaf shape	(a) Cuneate (2), (b) Obovate (1), (c) Lanceolate (43)
Prominence of leaf veins	(a) Smooth (42), (b) Rugose (4)
Petiole pigmentation	(a) Green (36), (b) Purple (3), (c) Pinkish green (7)
Terminal inflorescence shape	(a) Spike (16), (b) Panicle with short branches (22), (c) Panicle with long branches (8)
Presence of axillary inflorescence	(a) Absent (2), (b) Present (44)
Inflorescence density	(a) Low (14), (b) Intermediate (30), (c) Dense (2)
Inflorescence colour	(a) Green (36), (b) Pink (5), (c) Pinkish green (3), (d) Greenish pink (1), (e) Light pink (1)

Table 2: Promising vegetable amaranth entries identified for different biometric traits

Character	Range	Germplasm lines
Plant height	>130cm	IC257796, IC257797,IC 446463, IC526830, IC 8740, IC257794, IC526828
Number of Branches	>15	IC83740, IC 52684, IC 526828, IC 257796,SR-6267, IC257797.
Leaf length	>20 cm	IC 446470, IC 526831,IC 526828, IC446463, IC 257797, IC 257793, PRSA-699.
Leaf breadth	>10 cm	IC 526831, IC 446470, IC 257793, IC526828, IC257951
Leaf weight per plant	> 60 g	IC526828,IC 257794, IC 257792,IC257791
Stem weight per plant	>410 g	IC 526828, IC426560, IC 257792, IC 446470,

were confined to the top (4) and some to the base only (2). Stem pubescence was not present in (2) lines while it was low (5), medium (19) and conspicuous (5).Stem pigmentation ranged from green (10) to green with base pink (19) to purple (1) and green with basal half pink and top half green (1). Leaf pubescence was low in the majority of the lines (14), but it was medium (13) and conspicuous in six lines. Leaf pigmentation ranged from normal green (12), normal green with margins pigmented (3) to dark green (4) and dark green with margins pigmented (12). Leaf shape ranged from lanceolate (27) to elliptical (4). Wu-Huai Xiang *et al.* (2000) observed wide diversity for stem and leaf colour while evaluating the genetic resource collection from China . Xiao et al. (2000) classified 31 vegetable amaranth varieties based on 17 biological characters, of which leaf shape and colour were considered more practical for classifying amaranth varieties. Leaf veins were prominent in ten lines while it was smooth in rest of the lines (21) and the petiole pigmentation ranged from green (13), green with pink streak (9) to purple (9). Terminal inflorescence shape ranged from a spike (11) to a panicle with short branches (20). Axillary inflorescence was present in 29 lines and absent in two lines. Inflorescence density ranged from low (10) to dense (1) and intermediate (20). Inflorescence colour was green (10) red (18) and pink (3).

Promising entries identified for different important biometric traits are given in Table 2. These include lines with maximum plant height, leaf length, breadth, leaf and stem weight. IC 526828 recorded highest leaf weight (595.0g) followed by IC257792 (335.0 g) while maximum stem weight was observed in IC526828 (4875.0 g) followed by IC 257791 (3150.0 g), which is a desirable character in leafy vegetables. These lines can either be directly used for commercial cultivation or utilized in intervarietal hybridization to obtain segregating population.

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