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Selection for high protein with high seed yield traits in promising genotypes of grain amaranth (*Amaranthus hypochondriacus* L.)

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Abstract
Study was conducted to select the traits for seed yield and protein involving genotypes of grain amaranth at instructional farm of Indira Gandhi Agricultural University, Raipur during *Rabi* 2015-16. Highly significant differences among genotypes for all the traits studied were observed. PCV was in higher than the corresponding GCV. High heritability coupled with high genetic advance as % of mean was higher for grain yield /plant followed by panicle length, protein content and 1000 seed weight indicating that these traits were under additive gene control and simple selection can be used for further improvement in these traits for grain amaranth.

Keywords: grain amaranth, genotypes, protein, yield traits, variations

Introduction
Grain amaranth (*Amaranthus hypochondriacus* L.) is a protein rich pseudo-cereal crop belongs to family Amaranthaceae and are characterized by monoecious compound inflorescence. It is an underutilized crop can be of the ideal future crop having better nutritional properties endowed with C_4 metabolism suited to survive. Grain amaranth is widely cultivated both in hills and plains covering state of Himachal Pradesh, Uttranchal, Meghalaya, Jharkhand, Maharashtra, Odisha, Karnataka, Tamil Nadu and Chhattisgarh. The exact information about statistics on acreage and production in India are still not known. The existence variability within population for different economic characters for a successful breeding program which depends on selection of suitable genotypes. So the information on variability, heritability and genetic advance are utmost important. The amaranth varieties released so for in India are not up to the mark for seed yield and protein content. Cosidering the growing demand of high yielding genotypes with protein quality, the present was carried out.

Materials and Methods
18 promising genotypes (with high yielder and protein content) including two national check and one state check varieties *i.e.* B G A -2, G.A.-2 and C.G. Rajgira -1 respectively were obtained from coordinating centre of Ranchi, Bhubaneswar, Gujarat and IGKV, Raipur. These genotypes were evaluated in Randomized Block Design with three replications during rabi 2015-16 at Instructional farm of Indira Gandhi Agricultural University, Raipur (C.G.). Each genotype was raised in bed size of 3 m x 0.9 m. Biometrical observations were recorded. All the recommended agronomical practices were followed to facilitate good crop growth and development. The crop was maintained under semi irrigated condition. Observations were recorded on five competitive plants from each plot in each replication viz days to maturity, plant height (cm), panicle length (cm), 1000 seed weight and grain yield/ plant (g). The mean data were subjected to coefficient of variations (Singh and Chaudhary, 1985) [4], heritability (Allard, 1999) [1] and genetic advance as % of mean (Johnson *et al*., 1955) [3], respectively. The protein content in dry seeds determined by estimating the organic nitrogen by adopting the micro-Kjeldahl method (Hawk *et al*., 1954) [2].

Results and Discussion
The mean values, range and estimates of different yield parameters with protein content are given in table -1. Wide range for all the traits indicates the existence amount of variation among all promising genotypes. PCV was in higher than the corresponding GCV. Heritability

estimates (bs) were high (77.08 % - 96.61) for all traits. High heritability coupled with high genetic advance as % of mean was higher for seed yield / plant (85.12) followed by panicle length (56.51), protein content (47.64) and 1000 seed weight (40.00) indicating that these traits were under additive gene control and simple selection can be used for further improvement in grain amaranth. A similar result was found by Yadav and Sarawgi (2016) [5]. Rest of the traits like plant height and days to maturity showed low genetic advance as % of mean.

Table 1: Genetic parameters of variation for protein and seed yield traits in grain amaranth.

Traits	Mean	Range		GCV (%)	PCV (%)	H^2 (bs) %	Genetic advance as % of mean
		Min	Max				
Days to maturity	137.24	124.00	153.00	3.83	4.36	77.08	6.92
Plant height (cm)	163.71	120.20	192.40	9.35	10.10	85.68	17.83
Panicle length (cm)	19.28	11.80	34.70	28.17	28.94	94.78	56.51
1000 seed weight (g)	0.65	0.40	0.90	20.34	21.30	91.94	40.00
Protein (%)	9.80	6.70	15.20	23.53	23.94	96.61	47.64
Grain yield/ plant (g)	18.40	8.20	38.30	42.59	43.89	94.13	85.12

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