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Genotypic Correlation Coefficients among Growth, Yield and Quality Parameters in Bathua genotypes (*Chenopodium album* L.)

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In the present study, foliage yield per plant was significantly and positively correlated with plant height, number of leaves per plant, number of branches per plant, leaf area, stem girth, fresh weight of plant, dry weight of plant, foliage yield per plot, foliage yield per hectare, vitamin-A, vitamin-c, protein content, calcium content, magnesium content, iron content, zinc content at both phenotypic and genotypic level. Yield per plant was also positively and significantly correlated with plant spread E-W only at phenotypic level. Positive and significant correlation was found for fresh weight of plant with dry weight of plant, foliage yield per plot, foliage yield per hectare, vitamin-A content, vitamin-C content, calcium content, magnesium content, iron content, zinc content, foliage yield per plant at both phenotypic and genotypic level.

Introduction

Bathua (*Chenopodium album* L.) is an important underutilized leafy vegetable belongs to family Chenopodiaceae with a chromosome number of 2n=36.

It is commonly known with different vernacular names *viz.*, Lamb's quarters, Pig weed, Melde, Goose foot and Fat-hen in English; Bathua sag in Hindi; Kaduoma, Chakota, Sakothinasoppu in Kannada; Vastukah in Sanskrit; Chandan betu in Bengali; Parupukkirai, Chakkararthi Greens in Tamil; Pappukura in Telagu (Pandey, 2008). It is native to Europe and extensively distributed in different parts of world *viz.*, West Indies, South America, North America, Africa, Australia, Oceania and India (Pandey, 2008). In India, it is usually found in Upper gangetic plains, Kashmir, Punjab, West Bengal, Kumaon (Uttaranchal), Maharastra, Tamil Nadu, Karnataka and Peninsular India.

The fresh green leaves are highly nutritive and contains moisture (96 g), energy (30 kcal), protein (3.7 g), fat (0.4g), carbohydrate (2.9 g), fibre (2.1g), ca (150 mg), phosphorus (80 mg), vitamin-A (11,300 IU), thiamine (0.01 mg), riboflavin (0.14 mg), niacin (0.60 mg), vitamin-C (35 mg) (Pandey, 2008). It acts as a laxative, anthelmintic for hookworms, roundworms, antiphlogistic, antirheumatic, odontalgic and also acts as a blood purifier (Sanwal, 2008).

Correlations arise due to linkage, pleiotropism and developmental genetic interaction. Correlation of quantitative attributes would help in choosing component characters that are positively correlated with yield. To give a better insight of ancillary characters under selection, correlation coefficient analysis is a tool which measures the relationship between two or more variables. In view of the above facts In view of the above facts, the present studies entitled Genotypic Correlation Coefficients among Growth, Yield and Quality parameters in Bathua genotypes (*Chenopodium album* L.) was undertaken.

Materials and Methods

The investigation was carried out at Kittur Rani Channamma College of Horticulture, Arabhavi, Belagavi district (Karnataka) during *kharif* 2017. The details of the experiment, materials used and techniques adopted in present investigation are presented in this chapter. study comprised of twenty four genotypes the details give in Table number1 with three replications. The designed adopted for study is randomized block design. Each treatment or genotype in a replication was represented by a row of 5.00 meter length with 25 plants. All the cultural practices were carried out to manage the crop. The data were recorded on five competitive fertile plants for growth, yield and quality parameters

The data was analysed using INDOSTAT software programme. For the analysis of the data the following statistical methods were employed, namely analysis of variance, genetic parameters viz., genotypic and environmental variance, environmental coefficient of variation (Burton and Devane, 1952) and classified (high/medium/low) as suggested by Sivasubramanian and Madhavamenon (1973).

Results and Discussion

Correlation studies indicate the degree of inter-relationship of plant characters for improvement of yield as well as important quality parameters in any breeding programme. Hence, understanding of the inter-relationship between foliage yield and yield influencing characters is vital importance because this would facilitates effective selection for simultaneous improvement in one or more yield characters. The intense and direction of association among the characters was measured by simple correlation. In the present investigation both genotypic and phenotypic correlations worked out for foliage yield and its contributing character. In general, genotypic correlation was higher than phenotypic correlations for most of the characters studied. This indicates that the phenotypic expression of correlation is reduced due to the influence of environment.

In the present study, foliage yield per plant was significantly and positively correlated with plant height, number of leaves per plant, number of branches per plant, leaf area, stem girth, fresh weight of plant, dry weight of plant, foliage yield per plot, foliage yield per hectare, vitamin-A, vitamin-c, protein content, calcium content, magnesium content, iron content, zinc content at both phenotypic and genotypic level. Yield per plant was also positively and significantly correlated with plant spread E-W only at phenotypic level. Similar observations were made by Sarker *et al.,* (2014), Khurana *et al.,* (2013), Ahmmed *et al.,* (2012) for plant height; Sarker *et al.,* (2014), Khurana *et al.,* (2013) for number of leaves per plant; Sharma (2016), Khurana *et al.,* (2013) for number of branches per plant; Sarker *et al.,* (2014), Khurana *et al.,* (2013) for leaf area; Hassan *et al.,* (2013) for fresh weight of plant. Hassan *et al.,* (2013) for stem girth; Hassan *et al.,* (2013) for dry weight of plant; Since, these associated characters are in the desirable direction, it indicated that simultaneous selection for these characters would be rewarding in improving the foliage yield. Plant height exhibited highly significant and positive association with number of leaves per plant, number of branches per plant, leaf area, plant spread E-W, fresh weight of plant, dry weight of plant, foliage yield per plot, foliage yield per hectare, vitamin-A content, vitamin-C content, protein content, calcium content, magnesium content, iron content, zinc content, foliage yield per plant at both phenotypic and genotypic level. This indicates plant height is an important trait while selecting high yielding genotypes in bathua. Similar results were also reported by Kujur (2015), Diwan (2015) for number of leaves per plant, foliage yield per plot; Kujur (2015) for leaf area;

Number of leaves per plant had found significant and positive association with number of branches per plant, leaf area, fresh weight of plant, dry weight of plant, foliage yield per plot, foliage yield per hectare, vitamin-A content, vitamin-C content, protein content, calcium content, magnesium content, iron content, zinc content, foliage yield per plant at both phenotypic and genotypic level. It indicates if more number of leaves per plant it increases total foliage yield. Similar results were also obtained by Hassan *et al.,* (2013) for fresh weight of plant, dry weight of plant; Kujur (2015) for foliage yield per plot; Diwani (2015) for leaf area.

Table.1 Details of bathua genotypes used in study

Sl. No.	Genotypes	Source
1	EC-359444	NBPGR, New Delhi
2	NC-50229	NBPGR, New Delhi
3	HUB – 1	Local collection from Chikkaballapur
4	HUB – 2	Local collection from Gouribidanur
5	EC-359445	NBPGR, New Delhi
6	IC-243192	NBPGR, New Delhi
7	HUB – 3	Local collection from Arabhavi-2
8	IC-341703	NBPGR, New Delhi
9	HUB – 4	Local collection from Kondrapali
10	IC-109249	NBPGR, New Delhi
11	NIC-22506	NBPGR, New Delhi
12	HUB – 5	Local collection from Palampalli
13	NC-58616	NBPGR, New Delhi
14	NIC-22492	NBPGR, New Delhi
15	IC-109235	NBPGR, New Delhi
16	HUB-6	Local collection from Kauvara
17	HUB – 8	Local collection from Arabhavi -1
18	IC-415477	NBPGR, New Delhi
19	IC-540831	NBPGR, New Delhi
20	NIC-22517	NBPGR, New Delhi
21	HUB – 7	Local collection from Aruru
22	IC-540842	NBPGR, New Delhi
23	IC-4152393	NBPGR, New Delhi
24	HUB – 9	Local collection from Sangankeri

Table.2 Genotypic correlation coefficients among growth, yield and quality parameters in bathua

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	**1**	0.960**	0.925**	0.430**	0.963**	0.591**	0.261*	0.795**	0.777**	0.799**	0.839**	0.766**	0.991**	0.567**	0.845**	0.538**	0.820**	0.678**	-0.664**	-0.687**	-0.778**	0.946**
2		**1**	0.937**	0.835**	0.706**	0.885**	0.973**	0.931**	0.934**	0.919**	0.903**	0.459**	0.986**	0.733**	0.775**	0.632**	0.829**	0.640**	-0.676**	-0.686**	-0.918**	0.993**
3			**1**	0.657**	0.252*	0.565**	0.014	0.802**	0.831**	0.914**	0.964**	0.206	0.956**	0.554**	0.919**	0.629**	0.911**	0.869**	-0.726**	-0.674**	-0.460**	0.957**
4				**1**	-0.101	0.081	-0.04	0.587**	0.756**	0.616**	0.604**	0.262*	0.717**	0.594**	0.447**	0.579**	0.422**	0.359**	-0.220**	-0.425**	-0.697**	0.680**
5					**1**	0.959**	0.933**	0.112	0.191	0.185	0.163	0.253*	0.661**	-0.058	0.117	-0.08	0.656**	0.028	-0.639**	-0.351**	-0.313**	0.346**
6						**1**	0.900**	0.18	0.370**	0.157	0.368**	-0.101	0.617**	0.152	0.358**	-0.263*	0.521**	0.402**	-0.512**	-0.076	-0.082	0.161
7							**1**	-0.004	0.157	-0.592**	-0.281*	-0.439**	0.193	0.212	0.330**	-0.595**	0.571**	-0.243*	-0.579**	0.015	0.251*	-0.1
8								**1**	0.957**	0.946**	0.832**	0.627**	0.962**	0.355**	0.719**	0.828**	0.631**	0.376**	-0.614**	-0.740**	-0.487**	0.831**
9									**1**	0.890**	0.899**	0.473**	0.973**	0.357**	0.668**	0.740**	0.674**	0.425**	-0.623**	-0.742**	-0.533**	0.831**
10										**1**	0.867**	0.649**	0.728**	0.491**	0.604**	0.859**	0.517**	0.541**	-0.541**	-0.898**	-0.704**	0.927**
11											**1**	0.550**	0.743**	0.521**	0.631**	0.765**	0.615**	0.647**	-0.533**	-0.929**	-0.753**	0.935**
12												**1**	0.525**	0.275*	0.499**	0.572**	0.323**	0.375**	-0.326**	-0.478**	-0.660**	0.624**
13													**1**	0.547**	0.808**	0.621**	0.696**	0.562**	-0.670**	-0.656**	-0.775**	0.894**
14														**1**	0.554**	0.581**	0.407**	0.431**	0.115	-0.463**	-0.644**	0.604**
15															**1**	0.527**	0.636**	0.542**	-0.469**	-0.372**	-0.572**	0.683**
16																**1**	0.475**	0.391**	-0.197	-0.695**	-0.569**	0.769**
17																	**1**	0.531**	-0.277*	-0.565**	-0.233*	0.665**
18																		**1**	-0.314**	-0.296*	-0.512**	0.644**
19																			**1**	0.310**	0.595**	-0.527**
20																				**1**	0.666**	-0.843**
21																					**1**	-0.885**
22																						**1**

Critical r_g value at 5%= **0.2318**   Critical r_g value at 1% = **0.3017**   *significant at 5%   **Significant at 1%

1. Plant height
2. Number of leaves per plant
3. Number of branches per plant
4. Leaf area
5. Stem girth
6. Plant spread E- W
7. Plant spread N-S
8. Fresh weight of plant
9. Dry weight of plant
10. Foliage yield per plot
11.foliage yield per hectare
12. Vitamin-A
13. Vitamin-C
14. Protein
15. Calcium
16. Magnesium
17. Iron
18. Zinc
19. Oxalates
20. Nitrates
21. Total phenol
22. Foliage yield per plant

Number of branches per plant had found significant and positive association with leaf area, fresh weight of plant, dry weight of plant, foliage yield per plot, foliage yield per hectare, protein content, calcium content, iron content, zinc content, foliage yield per plant at both phenotypic and genotypic level. It indicates if more number of branches per plant it increases total foliage yield.

Leaf area is positively and significantly correlated with fresh weight, dry weight of plant, foliage yield per plot, foliage yield per hectare, vitamin-c content, protein content, calcium content, magnesium content, iron content, zinc content, foliage yield per plant at both phenotypic and genotypic level. It indicates if more leaf area it increases total foliage yield. Similar results were also obtained by Kujur (2015) for foliage yield per plot, dry weight of plant;

Positive and significant correlation was found for fresh weight of plant with dry weight of plant, foliage yield per plot, foliage yield per hectare, vitamin-A content, vitamin-C content, calcium content, magnesium content, iron content, zinc content, foliage yield per plant at both phenotypic and genotypic level. It indicates if more fresh weight of plant it increases total foliage yield. Positive and significant correlation was found for dry weight of plant with foliage yield per plot, foliage yield per hectare, vitamin-A, vitamin-C, protein content, calcium content, magnesium content, iron content, zinc content, foliage yield per plant. It indicates if more dry weight of plant it increases total foliage yield. Similar results were also obtained by Kujur (2015) for foliage yield per plot;

Positive and significant correlation was found for foliage yield per plot with foliage yield per hectare, vitamin-A, vitamin-c, protein content, calcium content, magnesium content, iron content, zinc content, and foliage yield per plant at both phenotypic and genotypic level. Similar results were also obtained by Kujur (2015) for foliage yield per plant.

Positive and significant correlation was found for foliage yield per hectare with vitamin-A, vitamin-C content, protein content, calcium content, magnesium content, iron content, zinc content, foliage yield per plant at both phenotypic and genotypic level. Vitamin A content had positive and significantly correlated with vitamin-C content, calcium content, magnesium content, zinc content, foliage yield per plant at both phenotypic and genotypic level. Vitamin C content had positive and significantly correlated with protein content, calcium content, magnesium content, iron content, zinc content, foliage yield per plant at both phenotypic and genotypic level.

Protein content had positive and significantly correlated with calcium content, magnesium content, iron content, zinc content, foliage yield per plant at both phenotypic and genotypic level. Calcium content had positive and significantly correlated with magnesium content, iron content, zinc content, foliage yield per plant at both phenotypic and genotypic level. Magnesium content had positive and significantly correlated with iron content, zinc content, foliage yield per plant at both phenotypic and genotypic level.

Iron content had positive and significantly correlated with zinc content, foliage yield per plant at both phenotypic and genotypic level. Zinc content had positive and significantly correlated with foliage yield per plant at both phenotypic and genotypic level.

From the foregoing discussions, it is conceivable that a great deal of success can be achieved in improvement of foliage yield per plant by applying selection pressure on plant height, number of leaves per plant, number of branches per plant, leaf area, stem girth, fresh weight of plant, dry weight of plant, foliage yield per plot, foliage yield per hectare as these traits had significant and positive correlation with foliage yield per plant.

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