Biological Forum – An International Journal **13(3a): 122-127(2021)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Genetic Plasticity Studies in Portulaca (*Portulaca oleracea* L.)

Kedarnath[1], Imamsaheb S.J.[2*] and C.N. Hanchinamani[3]
[1]M.Sc. Scholar, Department of Vegetable Science,
K.R.C College of Horticulture, Arabhavi, Belagavi-591218, (Karnataka), India.
[2]Head, AICRP (Tuber Crops), Regional Horticulture Research and Extension Centre,
Kumbapur, Dharwad-580005, (Karnataka), India.
[3]Professor and Head, Department of Vegetable Science,
College of Horticulture, UHS Campus, Bengaluru-560065, (Karnataka), India.

(Corresponding author: Imamsaheb S.J.)*
(Received 30 June 2021, Accepted 06 September, 2021)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: The Experiment was conducted at Kittur Rani Channamma College of Horticulture, Arabhavi, UHS, Bagalkot during the year 2018-19. In India even though it is rich source of nutraceuticals, still being treated only as a weed and its cultivation as a food crop and the effects of cultural conditions on its nutritional value is known very little. Estimation of the phylogenetic relationship and knowing the genetic diversity between genotypes in germplasm of any species is essential as it provides useful traits for further genetic development and increase selection efficiency. Genetic diversity in plant varieties can be estimated by observing the phenotypes of the plants and measuring the morphological characters which in turn lay foundation for breeding programs. Hence the present study on Genetic plasticity studies in portulaca, accessions collected from different location of Karnataka were undertaken. The experiment was laid out using randomized block design (RBD) with three replications. Observations were recorded on various yield and yield contributing characters. Analysis of variance indicated highly significant difference among the genotypes for all the characters indicating the presence of wide range of variability in the genotypes. The PCV was invariably higher than their corresponding GCV for all the traits. High GCV and PCV was observed for plant height (21.81 per cent and 22.71 per cent), number of leaves (29.95 per cent and 32.59 per cent), leaf area (30.31 per cent and 33.10 per cent), number of branches, number (25.20 per cent and 26.37 per cent), foliage yield per plant (43.51 per cent and 44.60 per cent), foliage yield per plot (34.77 per cent and 36.34 per cent), foliage yield per hectare (34.73 per cent and 36.31 per cent)and for quality parameters calcium, magnesium content, iron content, oxalate, nitrates and chlorophyll. It indicates existence of broad genetic base. High heritability coupled with high genetic advance over percent mean observed for the traits *viz.*, plant height, number of leaves, leaf area, number of branches, number of inflorescence per plant, secondary branches, plant spread E-W, plant spread N-S, stem girth, number of node, number of flowers, 1000 seed weight, fresh weight of plant, dry weight of plant, foliage yield per plant, foliage yield per plot, foliage yield per hectare, Vit-A, Vit-C, protein calcium, magnesium content, iron content, zinc, oxalate, nitrates and chlorophyll. This shows predominance of additive component for these characters and hence direct selection would be more effective in improving these traits.

Keywords: Variability, Heritability, Genetic Advance and *Portulaca oleracea.*

INTRODUCTION

Portulaca (*Portulaca oleracea*) is an important underutilised leafy vegetable crop, and it belongs to family Portulaceae with an chromosome number 2n=6x=54. Portulaceae family comprises about 40-100 species (Mitich, 1997).

Portulaca oleracea is described as a succulent annual with predominately prostrate growth, reproducing by stem cutting and also through seeds. Stems are glabrous, reddish in colour, and branch radially from the central axis forming a mat up to 60 cm in diameter. Leaves are alternate, sub alternate, or opposite; glabrous; succulent; sessile; and broad-rounded at the tips. Roots consist of a long thick tap root as well as many fibrous lateral roots. Flowers are yellow open on hot sunny mornings, and they are self-pollinate (Zimmerman, 1976).

The fruit is called as capsule contains minute many black colour seeds. Seeds are tuberculate, brownish-black and shiny in colour and measure 0.5 to 0.8 mm in diameter. Seeds are disseminates through wind and water. A signal plant may produce around 10,000 seeds (Holm *et al*., 1977; Matthews *et al*., 1993; Zimmerman, 1976). Seeds develop on the main branches first followed by on secondary branches throughout the growing season (Egley, 1974). It was recorded that on an average of 72 seeds per capsule (Dunn, 1970).

Portulaca rich source of potassium 494 mg/100g, magnesium (68mg/100g) and calcium (65mg/100g). and can used as potential source of omega-3 fatty acid and it is excellent source of alpha-tocopherol and ascorbic acid (26.6 mg and 506 mg per 100g of fresh and dry weight, respectively). The oxalate content range from 671 to 869mg/100g fresh weight. The antioxidant content and tremendous nutritional value of

Portulaca are essential for human consumption can be used as potential herb for the future (Kamal Uddin *et al.,* 2014). Due to its high nutritive and antioxidant properties purslane has been described as a ‘‘power food’’ (Alam *et al.,* 2014). Purslane is an important plant rich in important phytochemicals and nutritional components possessing medicinal, nutritional, medicinal, phytoremediation, and pharmacological properties (Alam *et al*., 2015; Uddin *et al*., 2014; Zhou *et al*., 2015). Purslane is also traditionally used as an ethnomedicinal plant (Sultana and Raheman, 2013; Iranshahy *et al*., 2017). Despite its multiple benefits, such as its nutritional and phytochemical richness, purslane still remains a neglected food crop of the indigenous communities, and studies on the genetic regulation of important traits and their improvement strategies is limited. Still being treated only as a weed and its cultivation as a food crop and the effects of cultural conditions on its nutritional value is known very little. Estimation of the phylogenetic relationship and knowing the genetic diversity between genotypes in germplasm of any species is essential as it provides useful traits for further genetic development and increase selection efficiency. Hence the present study on Genetic plasticity studies in portulaca, accessions collected from different location of Karnataka were undertaken.

MATERIAL AND METHODS

The experiment was conducted at research block of department of Vegetable Science at Kittur Rani Channamma College of Horticulture, Arabhavi, Belagavi district (Karnataka), UHS, Bagalkot during 2018-2019. The details twenty five genotypes mentioned in Table 1.

Table 1: Details of portulaca genotypes collected from various locations of Karnataka.

Sr. No.	Genotypes	Source
1.	HUB-1	Mannali
2.	HUB-2	Yakrana
3.	HUB-3	Gouspur
4.	HUB-4	Handikera
5.	HUB-5	Halburga
6.	HUB-6	Chandanahalli
7.	HUB-7	Ghatboral
8.	HUB-8	Ghatboral
9.	HUB-9	Ghatboral
10.	HUB-10	Ghatboral
11.	HUB-11	Ghatboral
12.	HUB-12	Ghatboral
13.	HUB-13	Ghatboral
14.	HUB-14	Ghatboral
15.	HUB-15	Ghatboral
16.	HUB-16	Ghatboral
17.	HUB-17	Ghatboral
18.	HUB-18	Bidar
19.	HUB-19	Bidar
20.	HUB-20	Bidar
21.	HUB-21	Bidar
22.	HUB-22	Bidar
23.	HUB-23	Bidar
24.	HUB-24	Bidar
25.	HUB-25	Bidar

The experiment was laid out by using Randomized complete block design (RCBD) design with three replications. The genotypes were randomly assigned in each replication. During study, observations *viz.*, plant height, number of leaves, leaf area, number of branches, primary branches, secondary branches, plant spread E-W, plant spread N-S, stem girth, number of node, internode distance, number of flowers, days to first flowering, days to 50% flowering, number of inflorescence per plant, fresh weight of plant, dry weight of plant, foliage yield per plant, foliage yield per plot, foliage yield per hectare, 1000 seed weight, Vit-A, Vit-C, protein, calcium, magnesium content, iron content, oxalate, nitrates and chlorophyll were recorded the data was subjected to statistical analysis.

RESULTS AND DISCUSSION

The results of the analysis of variance for thirty two traits are presented in Table 2 indicated that there is highly significant (at P = 0.01) differences among 25 genotypes of portulaca.

With a view to understand the extent to which the observed variations are due to genetic factors, the range, mean, phenotypic variance (PV), genotypic variance (GV), phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV), broad sense heritability (h^2), genetic advance (GA) and genetic advance as per cent of mean (GAM) were calculated and presented in Table 2. The data show that, existence of large amount of variability to most of the characters studied.

Table 2: Analysis of variance (mean sum of squares) for growth, yield and quality traits of portulaca genotypes.

Sr. No.	Source of variation/Characters	Replications	Treatments (germplasm)	Error
1.	Plant Height (cm)	10.46	159.93**	4.33
2.	Number of leaves per plant	83.71	897.72**	51.764
3.	Leaf area (cm^2)	1601.17	23849.44**	1438.64
4.	Number of branches per plant	2.99	23.71**	0.72
5.	Primary branches	0.019	0.12*	0.05
6.	Secondary branches	0.035	7.8**	0.58
7.	Plant spread N-S (cm)	0.14	570.25**	1.79
8.	Plant spread E-W (cm)	28.78	350.71**	15.68
9.	Stem girth (mm)	0.95	16.85**	0.80
10.	Number of nodes	4.75	481.18**	6.66
11.	Internode distance	0.27	1.31**	0.11
12.	Days to first flowering	10.65	14.64*	6.23
13.	Days to 50% flowering	6.97	26.59*	11.65
14.	Number of inflorescence per plant	1.48	181.39**	1.75
15.	Number of flower	12.11	8833.83**	32.11
16.	Fresh weight of plant (g)	14.97	1327.87 **	13.99
17.	Dry weight of plant (g)	0.11	9.74**	0.144
18.	Foliage yield per plant (g)	31.20	2231.26**	37.03
19.	Foliage yield per plot (kg)	0.017	10.81**	0.324
20.	Foliage yield per hectare (t)	0.078	46.87**	1.40
21.	1000 seed weight (g)	0.0013	0.011**	0.0009
22.	Vitamin- A (mg/ 100 g)	0.39	15.00**	0.38
23.	Vitamin –C (mg/100 g)	0.77	37.18**	0.133
24.	Protein (g)	0.007	1.47**	0.011
25.	Calcium (mg/100 g)	5.61	3622055.27**	13.44
26.	Magnesium (mg/ 100 g)	130.84	1572191.58**	281.09
27.	Iron (mg/100 g)	0.000007	0.068**	0.000013
28.	Zinc (mg/100 g)	0.000004	0.0010**	0.000004
29.	Chlorophyll (mg/100 g)	0.027	111.3**	0.010
30.	Oxalates (mg/100 g)	0.18	41651.31**	01.49
31.	Nitrates (mg/100 g)	11.94	4969.4**	9.87
32.	Total Phenols (mg/100 g)	33.54	826.46**	15.86

The mean values of different germplasm has indicates wide range of variability for various traits, which were studied in present investigation (Table 3). The range record for various traits *viz.*, plant height (50.71-23.05), number of leaves (96.60-33.15), leaf area (527.43-135.57), number of branches (16.67-5.36), primary branches (2.33-1.33), secondary branches (10.06-2.13), plant spread E-W (46.19-6.66), plant spread N-S (47.93-5.14), stem girth (13.99-4.86), number of nodes (66.23-10.87), internode distance (5.35-3.07), number of flowers (225.16-33.61), days to first flowering (30.81-23.67), days to 50 per cent flowering (40.59-27.74), number of inflorescence per plant (31.80-6.40), fresh weight of plant (99.01-23.40), dry weight of plant (9.97-2.38), foliage yield per plant (129.09-20.31), foliage yield per plot (9.896-2.77), foliage yield per hectare (20.62-5.78),1000 seed weight (0.48-0.24), Vit-A (17.10-8.78), Vit-C (30.12-19.58), protein (5.65-2.71), calcium (3721-100.66), magnesium (3240.66-6.66) content, iron (0.8317-0.3625) content, zinc (0.1963-0.1069), oxalate (610.78-113.82), nitrates (255.46-123.16), phenols (298.89-231.29) and chlorophyll (30.17-11.84).

Alone range values cannot asses variability, because it includes genotypic, environment and genotypic x environment variations. Hence, the estimation of GCV and PCV were carried out. In the present study, grater GCV and PCV were observed for observation *viz.*, leaf area, number of inflorescence per plant, fresh weight of plant, dry weight of plant, foliage yield per plant, foliage yield per plot, foliage yield per hectare, magnesium, iron, and zinc content of leaves. This shows that the existence of broad genetic base, which would be liable for further selection. This results agree the findings of Bhargava *et al.*, (2007); Bhargava *et al.*, (2010); Umakanta *et al.*, (2014); Meena *et al.*, (2014) for leaf area; Panda *et al.*, (2017), Bhargava *et al.*, (2007) for number of inflorescence per plant; Panda *et al.*, (2017); Ahammed *et al.*, (2012); Hasan *et al.*, (2013) for fresh weight of plant; Panda *et al.*, (2017); Hasan *et al.*, (2013); Shephalika (2010); Panda (2015) for foliage yield per plant; Bhargava *et al.*, (2007); Hasan *et al.*, (2013); Kujur (2015) for dry weight of plant; Bhargava *et al.*, (2006); Kujur (2015); Shukla *et al.*, (2005), Umakanta *et al.*, (2014) for foliage yield per plot; Bhargava *et al.*, (2010) for zinc content.

Table 3: Estimates of mean, range, components of variance, heritability, genetic advance and genetic advance over percent of mean for growth, yield and quality parameters in portulaca genotypes.

Sr. No.	Character	Mean	Range	GCV (%)	PCV (%)	h^2	GA	GAM (%)
1.	Plant Height (cm)	**33**	50.71-23.05	21.81	22.71	92.29	14.25	43.17
2.	Number of leaves per plant	**56.05**	96.60-33.15	29.95	32.59	84.49	31.79	56.79
3.	Leaf area (cm^2)	**285.08**	527.43-135.57	30.31	33.10	83.85	163.03	57.18
4.	Number of branches per plant	10.98	16.67-5.36	25.20	26.37	91.32	5.44	49.62
5.	Primary branches	**1.60**	2.33-1.33	10.04	17.37	33.43	0.19	11.96
6.	Secondary branches	**4.19**	10.06-2.13	37.22	41.46	80.72	2.88	68.89
7.	Plant spread N-S (cm)	**23.16**	47.93-5.14	59.41	59.69	99.06	28.22	121.81
8.	Plant spread E-W (cm)	**25.97**	46.19-6.66	40.68	43.44	87.69	20.38	78.47
9.	Stem girth (mm)	**9.02**	13.99-4.86	25.62	27.48	86.92	4.44	49.21
10.	Number of nodes	**29.15**	66.23-10.86	43.13	44.03	95.96	25.37	87.04
11.	Internodes distance	**4.19**	5.35-3.07	15.09	17.11	77.74	1.14	27.41
12.	Days to first flowering	**29.07**	30.81-23.67	5.75	10.33	31.00	1.91	6.60
13.	Days to 50% flowering	**36.32**	40.59-27.74	8.31	8.38	98.29	6.61	16.97
14.	Number of inflorescence per plant	**16.20**	31.80-6.40	47.74	48.43	97.14	15.71	96.93
15.	Number of flowers	**94.98**	225.16-33.6	57.02	57.33	98.92	57.02	57.33
16.	Fresh weight of plant (g)	**55.14**	99.01-23.40	37.94	38.55	96.90	42.43	76.95
17.	Dry weight of plant (g)	**5.28**	9.97-2.38	33.85	34.61	95.67	3.60	68.21
18.	Foliage yield per plant (g)	**62.15**	129.09-20.31	43.51	44.60	95.18	54.35	87.45
19.	Foliage yield per plot (kg)	**5.37**	9.896-2.77	34.77	36.34	91.51	3.68	68.52
20.	Foliage yield per hectare (t)	**11.20**	20.62-5.78	34.73	36.31	91.51	7.67	68.45
21.	1000 seed weight(g)	**0.35**	0.48-0.24	16.95	19.13	78.45	0.10	30.92
22.	Vitamin- A (mg)	**13.63**	17.10-8.78	16.18	16.81	92.66	4.37	32.09
23.	Vitamin –C (mg)	**24.96**	30.12-19.58	14.07	14.15	98.93	7.20	28.84
24.	Protein (g)	**3.65**	5.65-2.71	19.13	19.36	97.61	1.42	38.94
25.	Calcium (mg)	**1281.89**	3721-100.66	85.71	85.71	100	2263	176.57
26.	Magnesium (mg)	**2372**	3240.66-600	30.51	30.52	99.95	1490.25	62.81
27.	Iron (mg)	**0.67**	0.8317-0.3625	22.31	22.32	99.94	0.311	45.95
28.	Zinc (mg)	**0.13**	0.1963-0.1069	14.03	14.10	99.97	0.038	28.75
29.	Chlorophyll (mg)	**21.82**	30.17-11.84	28.29	28.3	99.97	12.7	58.27
30.	Oxalates (mg)	**379.22**	610.78-113.82	31.07	31.07	99.99	242.71	64.00
31.	Nitrates (mg)	**200.57**	255.46-123.16	20.27	20.33	99.41	83.50	41.63
32.	Total Phenols (mg)	**258.22**	298.89-231.29	6.36	6.54	94.46	32.90	12.74

Moderate GCV and PCV were recorded for plant height, primary branches , internode distance, 1000 seed weight, vitamin –A, vitamin-C, protein, zinc content. This indicates equal importance of additive and non additive gene action in these traits. These results are accordance with results of Panda *et al.,* (2017); Rekha and Pandey (2010); Selvan *et al.,* (2013); Hasan *et al.,* (2013) ; Mishra (2016); Meena *et al.,* (2014); Sharma (2016) for plant height; Selvin *et al.,* (2013) for protein content; Bhargava *et al.,* (2007) for vitamin –A content.

Low GCV and PCV was recorded for days to first flowering, days to 50 per cent flowering; stem girth, total phenol content of leaves. This indicates the narrow genetic base hence variability can be generated in these traits either through hybridization with divergent genotypes to recover transgressive segregants or by mutation breeding. These results are in conformity with the results of Bhargava *et al.,* (2007); Fikreselassie *et al.,* (2012) for days to 50% flowering, Shukla *et al.,* (2005), Diwan (2015) for stem girth.

High broad sense heritability (> 60%) was observed with respect to plant height, number of leaves per plant, leaf area, number of branches, secondary branches, plant spread N-S, plant spread E-W, stem girth, number of node, internode distance, days to 50 percent flowering, number of inflorescence, number of flowers, foliage yield per plant, foliage yield per plot, foliage yield per hectare, 1000 seed weight, Vitamin-A, vit-C, Protein, calcium, magnesium, iron, zinc, oxalates, nitrates and chlorophyll. Similar trends also reported by Panda *et al.,* (2017); Bhargava *et al.,* (2010); Umakanta *et al.,* (2014) for leaf area; Bhargava *et al.,* (2007), Shephalika (2010); Selvin *et al.,* (2013); Kujur (2015)

for days to 50% flowering; Panda *et al.*, (2017); Hasan *et al.*, (2013); Esiyok *et al.*, (2011) for fresh weight of plant; Bhargava *et al.*, (2008); Hasan *et al.*, (2013) for dry weight of plant; Panda *et al.*, (2017); Hasan *et al.*, (2013) for foliage yield per plant; Bhargava *et al.*, (2008), Umakanta *et al.*, (2014) for vitamin-A content; Bhargava *et al.*, (2003) for protein content; Bhargava *et al.*, (2010) for calcium, magnesium, iron, zinc content.

The very high estimates of heritability coupled with high values of genetic advance over per cent mean were observed for traits such as plant height, leaf area, number of branches, number of leaves, secondary branches, plant spread N-S, plant spread E-W, stem girth, number of node, internode distance, number of inflorescence, number of flowers, fresh weight of plant, dry weight of plant, foliage yield per plant, foliage yield per plot, foliage yield per hectare, 1000 seed weight, Vitamin-A, vitamin-C, Protein, calcium, magnesium, iron, zinc, oxalates, nitrates and chlorophyll. These characters are under the influence of additive gene action. These results are confirms the findings of Panda *et al.*, (2017), Umakanta *et al.*, (2014); Meena *et al.*, (2014) for leaf area; Panda *et al.*, (2017); Ahammed *et al.*, (2012) for fresh weight of plant; Hasan *et al.*, (2013), Esiyok *et al.*, (2011) for dry weight of plant; Panda *et al.*, (2017), Hasan *et al.* (2013) for foliage yield per plant; Umakanta *et al.*, (2014) for vitamin-A and calcium content; Selvin *et al.*, (2013) for protein content; Bhargava *et al.*, (2010) for magnesium, iron and zinc content; Singh and Pramila, (2009); Ahari *et al.*, (2010); Verma and Ali, (2012); Kole and Saha, (2013) for 1000 seed weight; Bhojanagouda, (2011); Abhishek, (2012) for plant height.

CONCLUSION

High degree of additive components like high estimates of heritability coupled with high GAM and presence of high GCV and PCV were obtained for the characters like plant height, number of leaves, leaf area, number of branches, number of inflorescence per plant, secondary branches, plant spread E-W, plant spread N-S, stem girth, number of node, number of flowers, 1000 seed weight, fresh weight of plant, dry weight of plant, foliage yield per plant, foliage yield per plot, foliage yield per hectare, Vit-A, Vit-C, protein calcium, magnesium content, iron content, zinc, oxalate, nitrates and chlorophyll. It indicates in portulaca genetic improvement can be achieve through selection by using the existing germplasms for above characters.

Conflict of Interest. None.

REFERENCES

Abhishek, N. (2012). Characterization of fenugreek (*Trigonella foenum-graecum* L.*)* genotypes through morphological characters. *Int. J. Agric. Env. Biotech.*, *5*(4): 453-457.

Ahammed, A. U., Rahman, M. M. & Mian, M. K. (2012). Genetic variability, heritability and correlation in stem amaranthus (*Amaranthus tricolor* L.). *Bangladesh J. Pl. Breed. Gen.*, *25*(2): 25-32.

Ahari, S. D., Hassandokht, M. R., Kashi, A. K., Amri, A., & Alizadeh, K. H. (2010). Genetic variability of some agronomic traits in the Iranian fenugreek landraces under drought stress and non-stress conditions. *Afr. J. Plant Sci.*, *4*(2): 12- 20.

Alam, A. M., Shukor, J. A., Rafii, M., Hamid, A. A., Farzad, Aslani, M. H., Asraf, M., Zainudin, M., & Kamal, U. M. (2014). Evaluation of Antioxidant Compounds, Antioxidant Activities and Mineral Composition of 13 Collected Purslane *Bio. Med. Res. Int.*, *4*(1): 10.

Alam, M. A., Juraimi, A. S., Rafii, M. Y., Hamid, A. A., Arolu, I. W. & Latif, M. A. (2015). Application of EST-SSR marker in detection of genetic variation among purslane (*Portulaca oleracea* L.) accessions. *Rev. Bras. Bot., 38* : 119–129.

Bhargava, A., Shukla, S., & Ohri, D. (2007). Genetic variability and interrelationship among various morphological and quality traits in Quinoa (*Chenopodium quinoa* Willd.). *Field Crops Res*., *101*: 104-116.

Bhargava, A., Shukla, S., & Ohri, D. (2008). Implications of direct and indirect selection parameters for improvement of grain yield and quality components in *Chenopodium quinoa* Willd. *Int.l J.l of Plant Prod*., *2* (3): 184-191.

Bhargava, A., Shukla, S., & Ohri, D. (2010). Short communication. Mineral composition in foliage of some cultivated and wild species of Chenopodium. *Spanish J. of Agri. Res.*, *8*(2): 371-376.

Bhargava, A., Shukla, S., Katiyar, R. S. & Ohri, D. (2003). Selection parameters for genetic improvement in Chenopodium grain yield in sodic soil. *J. Appl. Hort*., *5*(1): 45-48.

Bhojanagouda, P. (2011). Evaluation of fenugreek genotypes under northern transitional belt of Karnataka. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Diwan, I. S. (2015). Genetic studies in amaranthus (*Amaranthus sp.)* germplasm. *M.Sc. Thesis*, Indira Gandhi Krishi Vishwavidyalaya, Raipur.

Dunn, S. (1970). Light quality effects on the life cycle of common purslane. *Weed Sci*., *18*: 611-613.

Egley, G. H. (1974). Dormancy variations in common purslane seeds. *Weed Sci*., *22*: 535-540.

Esiyok, D., Bozokalfa, M. K., & Asciogul, T. K. (2011). Variability, heritability and association analysis in plant traits of swiss chard (*Beta vulgaris* subsp. *cicla*). *Genetika*, *43*(2): 239-252.

Fikreselassle, M., Zeleke, H., & Alemayehu, N. (2012). Genetic variability of Ethiopian fenugreek (*Trigonella foenum-graecum* L.) landraces. *J. Plant Breed. Crop Sci*., *4*(3): 39-48.

Hassan, M., Akther, C. A., & Raihan, M. S. (2013). Genetic variability, correlation and path analysis in stem amaranthus (*Amaranthus tricolor* L.) genotypes. *The Agriculturist*, *11*(1): 1-7.

Holm, L. G., Plucknett, D. L., Pancho, J. V., & Herberger, J., P. (1977). The world's worst weeds: Distribution and biology. Published for the East-West Centre by the University Press of Hawaii, Honolulu.

Iranshahy, M., Javadi, B., Iranshahi, M., Jahanbakhsh, S. P., Mahyari, S., & Hassani, F. V. (2017). A review of traditional uses, phytochemistry and pharmacology of *Portulaca oleracea* L. *J. Ethnopharmacol*, *205*: 158–172.

Kamal, U., Abdul, S. J., Md Sabir Hossain, Altaf Un Nahar, Md. Eaqub Ali & Rahman, M., M. (2014). Purslane Weed (*Portulaca oleracea*): A Prospective Plant Source of Nutrition, Omega-3 Fatty Acid, and Antioxidant Attributes. *The Sci. World J*., *3*(2): 9-14.

Kole, P. C. & Saha, A. (2013). Studies on variability and heritability for different quantitative characters in

fenugreek under different environments. *J. of Plant Breeding and Crop Sci.*, *5*(11): 224-228.

Kujur, A. (2015). Collection, Evaluation and identification of suitable genotypes of khedha (*Amaranthus dubius* Mart.) under Chhattisgarh plain condition. *M. Sc. (Agri.) Thesis*, Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh).

Matthews, J. F., Ketron, D. W. & Zane, S. F. (1993). The biology and taxonomy of the *Portulaca oleracea* L. complex in North America. *Rhodora*, *95*: 166-183.

Meena, Y. K., Kale, V. S., & Meena, O. P. (2014). Correlation coefficient and path analysis in coriander. *Int. J. of Scientific and Res. Publication*, *4*(6): 52-59.

Mishra, M. (2016). Genetic analysis for yield and its components in fenugreek. *M. Sc Thesis*, JNKVV, Jabalpur.

Mitich, L. W. (1997). Common purslane (*Portulaca oleracea*). *Weed Technol*., *11*: 394-397.

Panda, R. (2015). Variability studies in amaranthus (*Amaranthus* spp.), M. Sc. Thesis, orissa University of Agriculture and Technology.

Panda, R. K., Mishra, S. P., Nandi, A., Sarkar, S., Pradhan, K., Das, S., Patnaik, A., & Padhiary, A. K. (2017). Genetic variability and varietal performance in vegetable amaranthus (*Amaranthus* sp.). *J. of Pharmacognosy and Phytochemistry*, *6*(6): 1250-1256.

Rekha, S., & Pandey, R. M. (2010). Genetic studies for biochemical and quantitative characters in grain amaranthus (*Amaranthus hypochondriacus* L.). *Plant Omics*, *3* 4): 129-134.

Selvan, R. K., Yassin, M. G. & Govindaras, R. (2013). Studies on genetic parameters in grain amaranthus (*Amaranthus hypochondricus*) as influenced by plant densities. *J. Plant Breed. Gen*., *1*: 34-42.

Sharma, D., Naruka, I. S., Shaktawat, R. P., & Ajnave, S. R. (2016). Genetic variability studies in coriander (*Coriandrum sativum* L.). *The Bioscan.*, *11*(2): 1033-1036.

Shephalika, A. (2010). Diversity analysis for yield and quality traits in grain amaranth genetic resources. *M. Sc. Thesis*, Indian Agricultural Research Institute.

Shukla, S., Bhargava, A., Chatterjee, A., Srivastava, A., & Singh, S. P. (2005). Estimates of genetic variability in vegetable amaranthus (*Amaranthus tricolor*) over different cuttings. *Hort. Sci., 32*(2): 60-67.

Singh, S. P. & Pramila (2009). Correlation and Path analysis in fenugreek (*Trigonella foenum-graecum* L.). *Asian J. Horti., 4*(1): 105-107.

Sultana, A., & Raheman, K. (2013). Portulaca oleracea Linn: a global panacea with ethnomedicinal and pharmacological potential. *Int. J. Pharm. Pharm. Sci., 5*: 33–39.

Uddin, M. K., Juraimi, A. S., Hossain, M. S., Nahar, M. A. U., Ali, M. E. & Rahman, M. M. (2014). Purslane weed (*Portulaca oleracea*): a prospective plant source of nutrition, omega-3 fatty acid, and antioxidant attributes. *Scientific World Journal, 14*: 1-6.

Umakanta, S., Tofazzal, I., Golam, R., & Shinya, O. (2014). Genotypic variability for nutrient, antioxidant, yield and yield contributing traits in vegetable amaranth. *J. of Food, Agrri. & Environt., 12* (3&4): 168-174.

Verma, P., & Ali, M. (2012). Genetic variability in fenugreek (*Trigonella foenum-graecum* L.) assessed in South Eastern Rajasthan. *Int. J. Seed Spices*, 2(1): 56-58.

Zhou, Y. X., Xin, H. L., Rahman, K., Wang, S. J., Peng, C., & Zhang, H. (2015). Portulaca oleracea L.: a review of phytochemistry and pharmacological effects. *BioMed Res. Int., 5*(1): 925631.

Zimmerman, C. A. (1976).Growth characteristics of weediness in *Portulaca oleracea* L. *Ecology*., *57*(5): 964-974.

How to cite this article: Kedarnath, Imamsaheb, S.J. and Hanchinamani, C.N. (2021). Genetic Plasticity Studies in Portulaca (*Portulaca oleracea* L.). *Biological Forum – An International Journal*, *13*(3a): 122-127.