International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: SJIF: 5.995
Available Online at www.journalijcar.org
Volume 6; Issue 9; September 2017; Page No. 6302-6305
DOI: http://dx.doi.org/10.24327/ijcar.2017.6305.0914

Research Article

CORRELATION ANALYSIS OF GROWTH AND YIELD CHARACTERS IN *MARANTA ARUNDINACEA* L. (WEST INDIAN ARROWROOT)

Shintu P.V.*., Radhakrishnan V.V. and Mohanan K.V

Genetics and Plant Breeding Division, Department of Botany, University of Calicut, Kerala - 673 635, India

A R T I C L E I N F O

Article History:

Received 12th June, 2017
Received in revised form 3rd July, 2017 Accepted 24th August, 2017
Published online 28th September, 2017

Key words:

Correlation, selection, *Maranta arundinacea*, arrowroot

A B S T R A C T

Sixty genotypes of *Maranta arundinacea* L. were raised in randomized block design (RBD) in order to study the correlation of growth and yield characters existing in the species. The present study was carried out in the experimental plot of Genetics and Plant Breeding Division, Department of Botany, University of Calicut, Kerala, India during 2012-2015. Association analysis studies indicated that growth characters of *Maranta arundinacea* have certain inherent inter relationships with the yield attributing characters. It is further noted that plant height is the most important character showing significant positive correlation with maximum number of characters in both growth and yield characters studied. The study also revealed that plant height, number of leaves per tiller, number of rhizome and diameter of rhizome are positively correlated with yield. Hence the study provides a tool to select high yielding accessions based on the vegetative characters in *Maranta arundinacea*.

INTRODUCTION

Most of the characters of interest to breeders are much complicated due to the interaction of a number of components. Understanding the relationship between yield and yield components has utmost importance as breeders make the best use of this relationship in selection. Success of any breeding programme depends on the effectiveness of selection. Selection cannot be accomplished on the basis of a single character since most of the agronomic characters are polygenic in nature as well as they are interrelated. This relationship is due to the involvement of same set of alleles in the control of different characters and also due to the mutually complementing nature of the characters.

Tuber crops occupy a remarkable position in the food security of the developing world due to their high calorific value and carbohydrate content. They form the third principal group of food crops in the world after cereals and grain legumes. Nearly 550 million people throughout the world depend upon these crops and the area of cultivation is about 50.85 million hectares and produces 679 million tonnes of tubers every year. Tubers are often considered as a contrary crop of the future as they permit local production of carbohydrates, which can replace expensive imported cereals (Lebot, 2009). Among the tuber crops, *Maranta arundinacea* (West Indian arrowroot) occupies a prominent position because of their food and medicinal value. It has been used since ancient times for curing various stomach and urinary related diseases. Being a medicinal and economic plant species, it is cultivated in most of the homestead gardens of Kerala, India. However, concerted efforts were not taken place for the improvement of the yield in arrowroot. In the present study, correlation between agronomic characters in *Maranta arundinacea* was evaluated in order to identify the characters associated for the improvement of the crop.

Corresponding author:* **Shintu P.V.
Genetics and Plant Breeding Division, Department of Botany, University of Calicut, Kerala - 673 635, India

MATERIALS AND METHODS

The material for the present study consisted of 60 accessions of *Maranta arundinacea* collected from different places of northern districts of Kerala, India. The experiments were carried out in the experimental field of the Genetics and Plant Breeding Division, Department of Botany, University of Calicut, Kerala. The materials were grown in randomized block design with 3 replications. The experimental area has got a tropical climate enriched by South-West monsoon from June to August and North-East monsoon in October-November with occasional pre-monsoon showers in April and May and post-monsoon showers in December. Average temperature varies from 22 °C to 36 °C and annual rainfall is about 1500 mm (Anonymous, 2016).

For the field experiments, rhizomes multiplied in the experimental field were separated and rhizomes having a weight of 25-30 g were planted in 38 cm x 35 cm polybags filled with garden soil, sand and enriched compost in 3:1:1 ratio. 2 g of NPK (18:18:18) was applied at monthly intervals starting from the 30th day of planting till maturity.

Data on growth parameters were recorded by destructive sampling at the end of six months of growth whereas yield and rhizome characters were documented after harvest (Table 1). Correlation of the quantitative characters studied presently has been analyzed as per Rangaswamy (1995).

Table 1 Characters of *Maranta arudinacea* accessions studied

Sl. No.	Characters
	Vegetative characters
1	Plant height (cm)
2	Number of tillers
3	Number of leaves per tiller
4	Leaf length (cm)
5	Leaf breadth (cm)
6	Leaf area (cm^2)
	Yield characters
1	Yield per plant (g)
2	Number of rhizomes
3	Length of rhizome (cm)
4	Diameter of rhizome (cm)
5	Number of primary fingers
6	Length of primary finger (cm)
7	Diameter of primary finger (cm)
8	Starch content (mg/g)

RESULTS AND DISCUSSION

In the present study, correlation between agronomic characters in *Maranta arundinacea* was evaluated in order to understand the relationship of characters existing in the species since most of the agronomic characters are polygenic in nature as well as they are interrelated (Table 2).

Table 2 Correlation of characters in *Maranta arundinacea*

Characters	Plant height	Number of tillers	Number of leaves per tiller	Leaf length	Leaf breadth	Leaf area	Yield per plant	Number of rhizomes	Length of rhizome	Diameter of rhizome	Number of primary fingers	Length of primary finger	Diameter of primary finger
Plant height	1												
Number of tillers	0.603568*	1											
Number of leaves per tiller	0.691374*	0.42724	1										
Leaf length	0.782783*	0.336075	0.49758	1									
Leaf breadth	0.281524	-0.100204	0.247601	0.60491*	1								
Leaf area	0.585961*	0.120503	0.411693	0.889119*	0.893307*	1							
Yield per plant	0.670083*	0.195791	0.63248*	0.50234	0.291712	0.452614	1						
Number of rhizomes	0.695698*	0.743953*	0.547255*	0.362697	-0.05732	0.166718	0.599161*	1					
Length of rhizome	0.235862	0.026712	0.252481	0.407842	0.380094	0.435613	0.241718	0.079326	1				
Diameter of rhizome	0.266406	-20813	0.287171	0.317709	0.396141	0.411556	0.553465*	-0.00292	-0.03281	1			
Number of primary fingers	-0.30826	-0.12176	0.010893	-0.4841	-0.39367	-0.47435	-0.13154	-0.04726	-0.26436	-0.13694	1		
Length of primary finger	0.189611	-0.01143	0.288517	0.173296	0.338665	0.299528	0.361266	0.253616	-0.00878	0.22231	0.13146	1	
Diameter of primary finger	0.17918	0.040732	0.350204	0.179673	0.213248	0.232482	0.240504	0.060764	0.062354	0.125098	0.171319	0.494232	1
Starch content	-0.14579	-0.01101	-0.23612	-0.07397	0.069699	-0.0164	-0.30171	-0.14449	0.056035	-0.06175	0.04346	-0.15768	0.033339

* significant at 5% level

Out of the six growth characters, plant height showed significant positive correlation with maximum number of characters (Table 3). Number of tillers and leaf breadth showed inter relationship with minimum number of characters. Plant height was found to be significantly correlated with number of tillers, number of leaves per tiller, leaf length, leaf area, yield per plant and number of rhizomes. Number of tillers has positive correlation with plant height and number of rhizomes. Number of leaves per tiller showed positive correlation with three characters such as plant height, yield per plant and number of rhizomes. Leaf length showed significant positive correlation with plant height, leaf breadth and leaf area. Leaf breadth showed positive correlation with only two characters such as leaf length and leaf area. Plant height, leaf length and leaf breadth are the characters significantly correlated with leaf area.

Regarding the yield characters, yield per plant and number of rhizomes showed maximum significant positive correlation with other characters. Diameter of rhizome showed significant positive correlation with yield per plant only, whereas the characters like length of rhizome, number of primary fingers, length of primary finger, diameter of primary finger and starch content did not show significant positive correlation with any of the characters. Yield per plant exhibited significant positive correlation with plant height, number of leaves per tiller, number of rhizomes and diameter of rhizome.

The present study concludes that the growth characters of *Maranta arundinacea* have certain inherent interrelationships with the yield attributing characters. Similar results were reported by Rajyalakshmi *et al.*, (2013) and Rao *et al.*, (2004) in turmeric. It is further noted that plant height is the most important character showing significant positive correlation with maximum number of characters in both growth and yield characters studied.

The study also revealed that plant height, number of leaves per tiller, number of rhizome and diameter of rhizome are positively correlated with yield. Hence the study provides a tool to select high yielding accessions based on the vegetative characters in *Maranta arundinacea.*

Studies on correlation analysis of agronomic characters in Marantaceae are very rare. However correlation studies in *Curcuma longa* have been carried out by many workers

(Hazra *et al*., (2000); Raveendra *et al*., (2001); Panja *et al*., (2015); Tomar *et al*., (2005); Rao *et al*., (2006); Yadav *et al*., (2006); Prajapati *et al*., (2014). According to Raveendra *et al*., (2001) the rhizome yield showed significant positive correlation with plant height, leaf area, weight of mother rhizome and weight of primary fingers. Tomar *et al*., (2005) have reported that yield per plant showed positive correlation with plant height, leaf length, thickness of primary and secondary rhizomes and number of secondary rhizomes. A study carried out by Jayasree (2009) in mango ginger also showed significant positive correlation in both growth and yield characters. A study of correlation between fourteen agronomic characters of *Kaempferia galanga* also revealed significant positive correlation between the characters (Jayasree, 2009).

As study of correlation of characters play a crucial role in plant breeding, many workers have attempted such studies in several crop species. Ogunniyan and Olakojo (2014) evaluated the correlation of characters in maize. According to them grain yield showed positive correlation with anthesis, silking interval, plant and ear height, number of leaves per plant and leaf area. Study of correlation of characters has been also carried out in different crop plants like rice (Sarawgi *et al*., 1997; Agahi *et al*., 2007; Seyoum *et al*., 2012; Bornare *et al*., 2014), summer mustard (Akbar *et al*., 2003), winter rapeseed (Abbas., 2006; Aytac and Kinaci, 2009), eruca (Bozokalfa *et al*., 2010) and okra (Bello *et al*., 2006).

CONCLUSION

In the present study, sixty genotypes of *Maranta arundinacea* were evaluated for their correlation of characters in order to understand the relationship between characters. Correlation analysis revealed that plant height showed significant positive correlation with maximum number of characters. Regarding the yield characters, yield per plant and number of rhizomes showed the maximum significant positive correlation with other characters. Characters having maximum interrelationship with other characters display high level of gene sharing and can be used as lead characters in crop improvement. The present study concludes that the growth characters have certain inherent interrelationships with the yield attributing characters.

References

1. Abbas, G. 2006. Correlation analysis of some quantitative characters in *Brassica napus* L. *Journal of Agricultural Research,* 44(1): 7-14.
2. Agahi, K., Fotokian, M.H. and Farshadfar E. 2007. Correlation and path coefficient analysis for some yield related traits in rice genotypes (*Oryza sativa* L.). *Asian Journal of Plant Sciences,* 6(3): 513-517.
3. Akbar, M., Mahmood, T., Yaqub, M., Anwar, M., Ali, M. and Iqbal, N. 2003. Variability, correlation and path coefficient studies in summer mustard (*Brassica juncea* L.). *Asian Journal of Plant Sciences,* 2(9): 696-698.
4. Anonymous, 2016. http://www.world weather online.com
5. Aytac, Z., and Kınaci, G. 2009. Genetic variability and association studies of some quantitative characters in winter rapeseed (*Brassica napus* L.). *African Journal of Biotechnology,* 8(15): 3547-3554.
6. Bello, D., Sajo, A.A., Chubado, D. and Jellason, J.J. 2006. Variability and correlation studies in okra (*Abelmoschus esculentus* (L.) Moench). *Journal of Sustainable Development in Agriculture and Environment,* 2(1): 120-126.
7. Bornare, S.S., Mittra, S.K. and Mehta, A.K. 2014. Genetic variability, correlation and path analysis of floral, yield and its component traits in CMS and restorer lines of rice (*Oryza sativa* L.). *Bangladesh Journal of Botany,* 43(1): 45-52.
8. Bozokalfa, M.K., Lbi, E.D. and Asciogul, T.K. 2010. Estimates of genetic variability and association studies in quantitative plant traits of *Eruca* spp. landraces. *Genetika,* 42(3): 501-512.
9. Hazra, P., Roy, A. and Bandopadhyay, A. 2000. Growth characters of rhizome yield component of turmeric (*Curcuma longa* L.). *Crop Research,* 19(2): 235-240.
10. Jayasree, M., 2009. *Studies on Variability, Divergence and Improvement of Curcuma amada* Roxb. *and Kaempferia galanga* L. Ph.D. Thesis, Department of Botany, University of Calicut, Kerala, India. 202p.
11. Lebot, V. 2009. *Tropical root and tuber crops: cassava, sweet potato, yams and aroids.* Crop Production Science in Horticulture, no.17, CABI publishing, UK. 413p.
12. Ogunniyan, D.J. and Olakojo, S.A. 2014. Genetic variation, heritability, genetic advance and agronomic character association of yellow elite inbred lines of maize (*Zea mays* L.). *Nigerian Journal of Genetics,* 28(2): 24-28.
13. Panja, B., De, D.K., Basak, B. and Chattapadhyay, S.B., 2015. Correlation and path analysis in turmeric (*Curcuma longa* L.). *Journal of Spices and Aromatic Crops,* 11(1): 70-73.
14. Prajapati, K.N., Patel, M.A., Patel, J.R., Joshi, N.R. and Patel, A.D. 2014. Genetic variability, character association and path coefficient analysis in turmeric (*Curcuma longa* L.). *Electronic Journal of Plant Breeding,* 5(1): 131-137.
15. Rajyalakshmi, R., Naidu, L.N., Rajasekhar, M. and Sudhavani, V. 2013. Genetic variability, correlation and path coefficient analysis in turmeric (*Curcuma longa* L.). *Journal of Spices and Aromatic Crops,* 22(1):104-107.
16. Rangaswamy, R. 1995. *A Textbook of Agricultural Statistics.* New Age International (P) Limited, New Delhi, India. 496p.
17. Rao, A.M., Rao, P.V., Reddy, Y.N. and Ganesh M. 2004. Variability and correlation studies in turmeric (*Curcuma longa* L.). *Crop Research,* 27(2-3): 275-281.
18. Rao, A.M, Rao, P.V., Reddy, Y.N. and Ganesh, M. 2006. Path coefficient analysis in turmeric (*Curcuma longa* L.). *Indian Journal of Agricultural Research,* 40(4): 286-289.
19. Raveendra, B.H., Hanamashetti, S.I. and Hegde, L.N. 2001. Correlation studies with respect to growth and yield of sixteen cultivars of turmeric (*Curcuma longa* L.). *Journal of Plantation Crops,* 29(3): 61-63.
20. Sarawgi, A.K. Rastogi, N.K. and Soni, D.K. 1997. Correlation and path analysis in rice accessions from Madhya Pradesh. *Field Crops Research,* 52(1):161-167.

21. Seyoum, M., Alamerew, S. and Bantte, K. 2012. Genetic variability, heritability, correlation coefficient and path analysis for yield and yield related traits in upland rice (*Oryza sativa* L.). *Journal of Plant Sciences*, 7(1): 13-22.
22. Tomar, N.S., Nair, S.K. and Gupta, C.R. 2005. Character association and path analysis for yield components in tumeric (*Curcuma longa* L.). *Journal of Spices and Aromatic Crops*, 14(1): 75-77.
23. Yadav, R.K., Yadav, D.S., Raj, N., Asati, B.S. and Singh, A.K. 2006. Correlation and path coefficient analysis in turmeric (*Curcuma longa* L.). *Indian Journal of Horticulture*, 63(1): 103-106.

How to cite this article:

Shintu P.V *et al* (2017) 'Correlation analysis of growth and yield characters in Maranta arundinacea L. (west indian arrowroot)', *International Journal of Current Advanced Research*, 06(09), pp. 6302-6305.
DOI: http://dx.doi.org/10.24327/ijcar.2017.6305.0914

****