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ARTICLE

# VARIABILITY ANALYSIS AMONG VARIOUS ACCESSIONS OF *AGERATUM CONYZOIDES* USING AGROBOTANIC TRAITS

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**Abstract**

*Ageratum conyzoides* is an erect, herbaceous annual, up to 75 cm in height belonging to the family Asteraceae. Genotypic coefficient of variation(GCV), phenotypic coefficient of variation (PCV), heritability (h2), genotypic correlation coefficient(rG) and phenotypic correlation coefficient(rP) in respect of 9 agrobotanic traits were estimated based on data of 20 accessions of the species occurring in Kerala. Comparing the estimates of GCV and PCV for the 9 traits, it was found that the PCV values consistently dominated, suggesting substantial influence of environment on the expression of these characters. Fairly high heritability values were registered for most of the characters, which suggests less influence of environment. Phenotypic correlation coefficient values of most of the character pairs studied were higher than their genotypic correlation coefficients, which is suggestive of higher influence of environmental factors in inhibiting strong inherent relationships between such character pairs.

**Keywords:** *Ageratum conyzoides* , GCV, PCV, correlation coefficient, heritability, genetic gain

## Introduction

*Ageratum conyzoides* is an erect, herbaceous annual, up to 75 cm in height belonging to the family Asteraceae; commonly called goat weed or billy goat weed, derive from its peculiar odour like that of male goat (Okunade, 2002). Stem and leaves pubescent; leaves are opposite, with long petioles; capitulum campanulate. In folk medicine it is used for the treatment of pneumonia, cure wounds and burns (Durodola, 1977). Plant is widely used in traditional medicine in tropical and subtropical regions of the world due to its anti-inflammatory and antibacterial properties (Maglhaes et al., 1997), antimicrobial (Amadi et al., 2007). It contains many bioactive compounds including flavonoids, alkaloids, cumarins, essential oils, chromenes, benzofurans, terpenoids and tannins. Many of these are biologically active (Jaccoud 1961).

On account of the profound medicinal value, the species is being indiscriminately collected from the wild leading to overexploitation and depletion of this valuable genetic resource. Despite being a priceless medicinal commodity, very little attempt has been known for evaluating the genetic variability of its agrobotanic traits, and estimation of genetic parameters such as genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), heritability (h2), genetic gain, genotypic correlation coefficient (rG) and phenotypic correlation coefficient (rP) which are important prerequisites for genetic improvement of the plant. Selection of germ plasm depends on discrete knowledge of genetic variability of various plant characters (Mishra et al.1995).The genotypic and phenotypic correlation coefficients are the measures of the degree of closeness of the linear relationship between pairs of variables, of which the former describes the inherent relationship between pairs of variables, while the latter is a measure of modified genotypic expression due to the environment. Heritability (h2), in broad sense, is a measure of sets of genes exhibiting dominance, which is useful for judging the expression of a character. Genetic gain provides the degree of gain obtained in a character under a particular selection pressure. This paper concerns the estimation of the above major genetic parameters in regard to 9 agrobotanic traits of A.conyzoides.

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## Materials and Methods

The plants growing in different ecological niches in the state of Kerala are found to possess immense variability in many of its morphological characters, both qualitative and quantitative. Fifteen accessions of the species,5 each from 4 districts such as Thiruvananthapuram, Kollam, Pattanamthitta and Idukki were collected. Nine quantitative agrobotanic traits such as leaf length, leaf breadth, leaf area, leaf perimeter, petiole length, anther length, ovary length, style length and fruit length were selected for the study (Table I).The accessions were grown in Randomised Block Design with 2 replications, and simple random sampling was followed for collecting the data. Five observations were

**Table 1. Genetic parameters of 9 agrobotanic traits in 20 accessions of *A. conyzoides***

| Sl.No. | Characters | Genotypic coefficient of variation(GCV) | Phenotypic coefficient of variation(PCV) | Heritability(h2) |
|---|---|---|---|---|
| 1 | Leaf length | 20.23 | 35.52 | 0.32 |
| 2 | Leaf breadth | 48.06 | 36.41 | 0.57 |
| 3 | Leafarea | 54.84 | 83.64 | 0.43 |
| 4 | Leaf perimeter | 24.72 | 38.25 | 0.42 |
| 5 | Petiole length | 57.07 | 62.07 | 0.85 |
| 6 | Anther length | 51.65 | 52.79 | 0.96 |
| 7 | Ovary length | 48.65 | 49.34 | 0.99 |
| 8 | Stylelength | 41.7 | 42.04 | 0.98 |
| 9 | Achene length | 41.33 | 41.81 | 0.98 |

scored for each character from each plant. The genotypic and phenotypic coefficients of variation (Burton 1952), genotypic and phenotypic correlation coefficients (Snedecor & Cochran 1980) and heritability (Hanson et al.1956) of the traits were estimated.

## Results and Discussion

The results of genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV) and heritability of 9 agrobotanic traits are furnished in the Table 1. The GCV was maximum for petiole length (57.07) and minimum for leaf area (20.23). PCV also was maximum for leaf area (83.64) and minimum for leaf length (35.52). Heritability was higher for ovary length (0.99) followed by style length and achene length (0.98) and lower for leaf length (0.32). Comparing the estimates of GCV and PCV for the 9 traits, it was found that the PCV value consistently dominated. The genotypic and phenotypic correlation coefficients estimated between and among the 9 character combinations, at 5% and I% levels, are given in Table II. Notable range exists for both genotypic and phenotypic characters. Among the various pairs of characters, which exhibited significant positive genotypic correlations coefficient (at I% level), the most significant was that between leaf length with leaf perimeter, and leaf area with leaf perimeter (r=0.95), followed by leaf breadth with leaf area(r= 0.92).Most significant phenotypic correlation coefficient was between leaf area with leaf perimeter (r=0.97) and also between leaf length with leaf perimeter(r=0.96).

GCV of various traits provides a measure of the extent of genetic variability residing in the genotypes (Kavitha et al. 2007). In the present study, both the GCV and PCV are maximum for leaf area as against the minimum for leaf length. For the entire assemblage of agrobotanic traits, the PCV values are higher than the corresponding GCV except leaf breadth, which is suggestive of influence of environment on the expression of these characters. Similar results were reported in several crop plants like Piper nigrum (Mathew et al.1999) and Cucumis sativus (Shet et al. 2018) .The PCV value for leaf area (83.64) is noticeably higher than its GCV (54.84), which implies high influence of environment in determining leaf area ,while difference between GCV and PCV is marginal in the case of a few traits such as anther length, ovary length, style length and achene length which is suggestive of negligible influence of environment on them, and in these cases , simple selection would be highly effective for further improvement as suggested against similar results in cucumber (Shet et al.2018). Heritability, in broad sense, has important role in determining the heritable portion of variation. The present study revealed higher heritability values for most of the characters, which indicates less influence of environment, and is governed by additive gene effects (Shet et al.2018). High heritability coupled with high genetic advance indicated addictive gene action in the control of making these characters to respond better for selection. The phenotypic correlation coefficient values of most of the character pairs studied are consistently higher than their genotypic correlation coefficients, which suggest higher influence of environment.

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**Table 2. Genotypic and phenotypic correlation coefficients among 9 agrobotanic traits in 20 accessions of *A. conyzoides***

| Sl. No. | Characters | | Leaf length | Leaf breadth | Leaf area | Leaf perimeter | Petiole length | Anther length | Ovary length | Style length | Achene length |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Leaf length | $r_G$ | 1.00 | 0.80** | 0.89** | 0.95** | 0.17 | −0.07 | 0.07 | 0.14 | −0.03 |
| | | $r_P$ | 1.00 | 0.78** | 0.93** | 0.96** | 0.33* | −0.09 | 0.19 | 0.23 | −0.06 |
| 2 | Leaf breadth | $r_G$ | | 1.00 | 0.92** | 0.88** | 0.52** | −0.12 | −0.06 | 0.14 | 0.28 |
| | | $r_P$ | | 1.00 | 0.93** | 0.91** | 0.54** | −0.14 | −0.10 | 0.15 | 0.39 |
| 3 | Leaf area | $r_G$ | | | 1.00 | 0.95** | 0.41** | −0.1 | −0.01 | 0.13 | −0.21 |
| | | $r_P$ | | | 1.00 | 0.97** | 0.50** | −0.12 | −0.02 | 0.15 | −0.29 |
| 4 | Leaf perimeter | $r_G$ | | | | 1.00 | 0.31* | −0.02 | 0.02 | 0.16 | 0.21 |
| | | $r_P$ | | | | 1.00 | 0.42** | −0.03 | 0.07 | 0.25 | 0.15 |
| 5 | Petiole length | $r_G$ | | | | | 1.00 | 0.32** | −0.39 | 0.11 | −0.58 |
| | | $r_P$ | | | | | 1.00 | 0.03 | −0.35 | 0.12 | −0.52 |
| 6 | Anther length | $r_G$ | | | | | | 1.00 | 0.22 | 0.56** | 0.19 |
| | | $r_P$ | | | | | | 1.00 | 0.22 | 0.59** | 0.20 |
| 7 | Ovary length | $r_G$ | | | | | | | 1.00 | 0.64** | 0.78** |
| | | $r_P$ | | | | | | | 1.00 | 0.65** | 0.81** |
| 8 | Style length | $r_G$ | | | | | | | | 1.00 | 0.42** |
| | | $r_P$ | | | | | | | | 1.00 | 0.43** |
| 9 | Achene length | $r_G$ | | | | | | | | | 1.00 |
| | | $r_P$ | | | | | | | | | 1.00 |

** 1% * 5%



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