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Grouping of some Populations of *Achillea tenifolia*, Regarding Morphologic Features by Using Multi-variety Statistical Methods

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ABSTRACT

Sufficient understanding of genetic variation and grouping of germplasm to choose appropriate parents for better-race purposes is obligatory. In this study, the achieved data from measuring morphologic features was used to examine genetic variation and categorize genotypes. For this purpose, 32 *Achillea* populations from *A. tenifolia* variety were done in education and research farm of Iran's forests and pastures institute located in Alborz province according to complete accidental block plan (RCBD) in three replicates. Variance Analysis demonstrated that the genotypes under study are of a significant difference regarding the examined features. The correlation of stalk number features with height feature was significant at 5% level and the rest of features were significant at 1%. In mean comparison between cultures, it became clear that cluster 1 genotypes had more mean for all features. Cluster 2 genotypes were of the least features mean. In cluster 3, genotypes had more mean with respect to bush height and branch-head yield, however, regarding diameter of head-coverage and steem number were on average.

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INTRODUCTION

Herbs are among the very valuable resources in wide range of Iran's natural resources that if they are scientifically known, cultivated, developed and employed correctly, they can play an important role in the society population, job-creation, and non-oil exports. Currently, about 66 thousand hectares from agricultural lands in Iran's different provinces are devoted to herbs cultivation [1].

From the whole devoted farms to herbs, about 65 thousand tons crops are produced. *Achillea* is one of the valuable herbs that seeds of its varieties have been collected in the plant of collecting grass plants and herbs in gene bank. This genus holds 19 varieties of perennial grass plants in Iran that its 7 varieties belong to Iran only.

Many researchers have applied multi-variety statistical methods for reducing many numbers of correlated variables to less number of main constituents. Furthermore, experience is used as the main constituent to categorize genotypes. This method, in fact, is as counterpart of cluster analysis. The aim for cluster analysis is to find real classes of individuals and reduce data numbers. Parents, being genetically different, produce hybrids with more heterosis. On the other hand, to define characteristic and classify germplasm allow racers to avoid overdoing in sampling from populations [2]. Javadian *et al*, [3], in grouping 15 genotypes of black-eyed peas, classified them in three clusters using cluster analysis. Safaei *et al* [4] declared that plant yield is of positive and significant correlation with features like days to complete ripeness and essential oil percentage and the first four constituents, in decomposition to main constituents, justified 85 percent of the whole variables' variance. Also, 198 sainfoin masses, into three groups based on cluster analysis and decomposition to agents was categorized [5].

In an examination, genetic variety of 12 *Bromus* populations showed that correlation coefficient was positive and significant between hay and seed yield and relationship between these two features and other features was similar, so that the two features had positive correlation with appearance date of ear, bush height, stalk numbers and seed numbers in ear and negative and significant correlation with 1000-seeds weight [6]. By cluster analysis by Ward method, the populations of two varieties were completely differentiated. The achieved results from decomposition to main constituents also verified classification through cluster method. This

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examination was conducted in order to define genotypes' variety and classification and also define their relativeness degree and genetic similarity through cluster analysis by Ward method.

Methods:

This experiment was performed on educational and research farm of Iran's forests and pastures institute located in Alborz province according to complete accidental block plan (RCBD) in three replicates. Seeds were cultivated in Jiffy pots and irrigation was done when necessary. Care and maintenance operation continued up to the end of February. When the germinated plants grew sufficiently (leaf 4-5 stage) were transported to fresh air in order to give fresh air and adjust with farm conditions and these scions were transported to Alborz station to be planted on the main land in early March where they were transported to farm with GF / JF pots. On far, according to complete accidental blocks plan with three replicates for populations of *A. tenifolia* variety, so that each plot or experimental unit consisting of 2 rows with 50cm distance and 15 bushes on each row with 50 cm distance from each other (totally 30 bushes in each plot) were planted and then care and maintenance operation including drip-irrigation, based on plants water requirement was performed and according to the plant, controlling and weeding was continuously performed. During plan execution and also after finishing the work (margins elimination), measurement and noting from features was done. Cluster analysis was used to group genotypes by Ward method. To define validity of cluster analysis, decomposition into main constituents and variance analysis of clusters were performed. Then dendrogram of correspondence between cluster analysis and cluster analysis was drawn. In this study, the software MiniTab.16 was used.

Results:

Having examined normal condition of data distribution, analysis of variance was done and it was observed that difference between genotypes for the feature bush height was significant as 5% level and for the rest of features it was significant at 1-percent level that this thing demonstrates great variation between these features in genotypes under study. The results from examining the features' phenotype correlation (tab. 1) showed that the correlation between all features was positive and significant. The correlation of the feature stalk number with the feature height was significant at 5-percent level and other features with one another at 1-percent level. In cluster analysis by Ward method or dendrogram cottage in 717 distance, genotypes were put in 3 clusters (fig. 1). In mean comparison between clusters, it was defined that cluster-1 genotypes had more mean for all features, cluster-2 genotypes were of the least features mean. In cluster 3, genotypes had more regarding bush height and branch-head yield, but with respect to coverage-head diameter and stalk number were on average (tab. 2).

For the features bush height and branch-head yield, there exists no significant difference between clusters 3 and 1 genotypes. Regarding this fact that the greatest distance exists between clusters 1 and 2, at the result, in plant breeding programs in order to achieve the maximum variation, we can use the individuals in these clusters.

Table 1: Phenotype coloration of *A. tenifolia* populations.

	diameter of head-coverage (cm)	High shrub (cm)	Number of stem in shrub	branch-head yield
High shrub (cm)	0.47**			
The number of steem in shrub	0.73**	0.38*		
branch-head yield	0.71**	0.69**	0.56**	
Total flowers in shrub	0.81**	0.67**	0.71**	0.83**

*, **: Significant at the 5 and 1 percent probability levels.

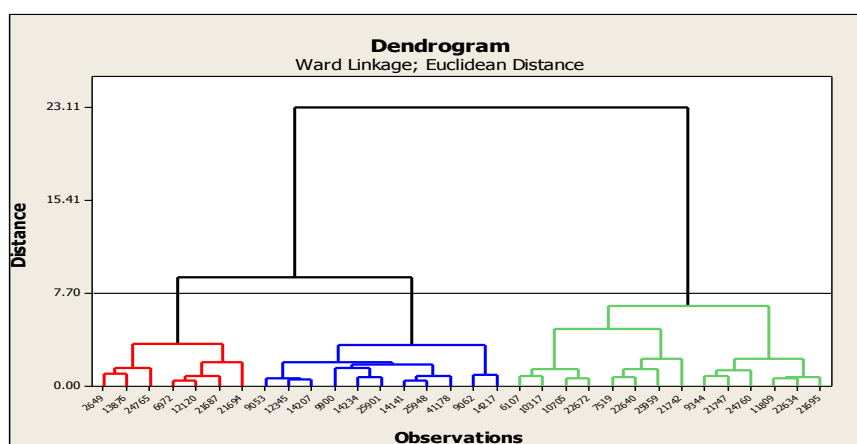


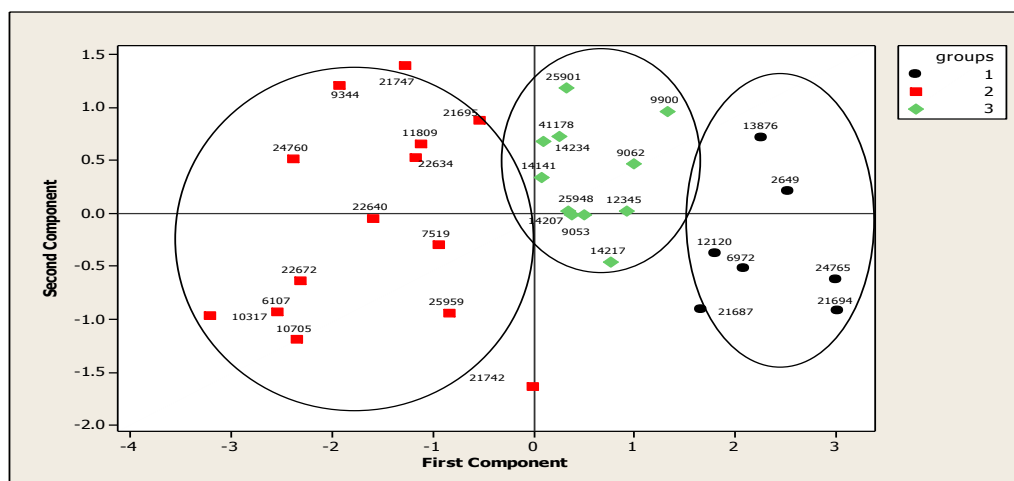
Fig. 1: Dendrogram of Cluster analyze with Ward method for genotypes.

Table 2: Mean comparison between Clusters in *A. tenifolia* populations.

diameter of head-coverage (cm)	High shrub (cm)	Number of stem in shrub	branch-head yield	Cluster No.
54.50 ^a	85.94 ^a	43.28 ^a	212.36 ^a	1
20.90 ^c	51.61 ^b	16.28 ^c	92.70 ^b	2
36.14 ^b	77.28 ^a	25.59 ^b	171.66 ^a	3

In every row the averages which own some common letters do not have significant difference (probability level of 5%).

Decomposition to main constituents showed that the first and second constituents encompass 73 and 16 % of the whole variance respectively, which based on the constituents; by-plot graph is drawn. With respect to fig. 2 in Scatter to population of *A. Tenifolia* variety based on the first and second constituents, there existed a good correspondence between cluster analysis and decomposition to main constituents. Decomposition to main factors by a method to define desirable number of clusters, too.

**Fig. 2:** Dendrogram of correspondence between cluster analysis and decomposition to main constituents.

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