

# Investigation of Species and Functional Diversity and Community Structure for Weeds in Wheat and Sugar Beet Fields Across the Provinces of Iran



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## Introduction

According to the FAO, agrobiodiversity defined as the diversity of animals, plants, and microorganisms that are important for agriculture and food production, and the interaction between the environment, genetic resources, management systems, and human operations and includes three levels of genetic diversity, species and ecosystem [1,2]. The loss of biodiversity in the agroecosystems is a serious threat to the survival of these systems and ultimately to world food security. To properly protect and exploit the ecological biodiversity of agroecosystems, it is necessary to know the characteristics and spatial and temporal distribution of its components at all levels [3]. The role of weeds as the inseparable component of agroecosystems, in creating and developing diversity in agricultural systems is of particular importance, because many crops are closely related to them also wild species and genetic exchange takes place between them. On the other hand, many weeds are the habitat and of natural predators of crops pests, birds and small mammals, so maintaining a population of weed species within a certain threshold should be considered without adversely affecting crop yield contributes to the survival of other ecosystem organisms [4,5]. The study of biodiversity and weed grouping can be effective and useful in determining the critical period of their control. Considering the importance of two crops of wheat and sugar beet and their place in the agricultural economy, this study was conducted to investigate species and functional diversity and community structure for weeds in wheat and sugar beet fields in different provinces of Iran, using data from a previous projects on weed control conducted by Ministry of Agriculture.

## Material and Methods

After determining the functional groups (life cycle, morph type, photosynthesis pathway, level of noxiousness) of existing weeds (extracted from questionnaires and information resources of the Ministry of Agriculture) the degree of similarity of the provinces in terms of their functional diversity in wheat and sugar beet fields, cluster analysis and similarity index between provinces in terms of species weeds were identified using equation 1.

$$\text{Similarity index} = 2C_{ij}/C_i + C_j$$

Where  $C_{ij}$  is the number of common weed species compared between two provinces,  $C_i$  Number of weed species in the first province,  $C_j$  Number of weed species in the second province.

The code assigned to each province is given in (Table 1). Cluster analysis was performed using Minitab software and similarity index was calculated using Excel software.

## Results and Discussion

Total number of weed species were 72 and 52 species in wheat and sugar beet, respectively. In the wheat fields, Poaceae and Asteraceae showed the most diversity amongst monocotyledonous and dicotyledonous groups. In the sugar beet fields, Poaceae and Brassicaceae were the most diverse family amongst monocotyledonous and dicotyledonous groups. Provinces were grouped in three clusters for functional weed

groups in wheat and sugar beet fields (similarity 75%). Tehran and East Azerbaijan had the highest similarity percentage (71%) amongst the provinces for weed diversity in wheat (Figure 1). In sugar beet fields, the highest similarity percentage was observed in Hamedan and Kohkiluyeh boier-ahmad (71%), Ilam-Ardabil and Khoozestan-Ardabil provinces showed the lowest (Figure 2).

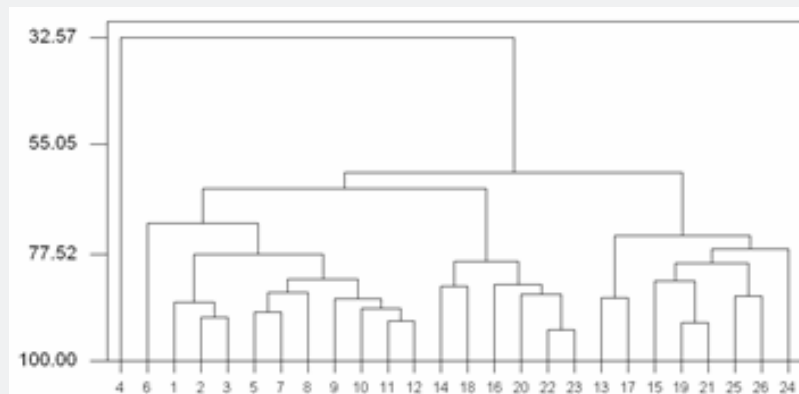
**Conclusion**

Despite the importance of biodiversity in maintaining and improving the stability of natural and agricultural ecosystems,

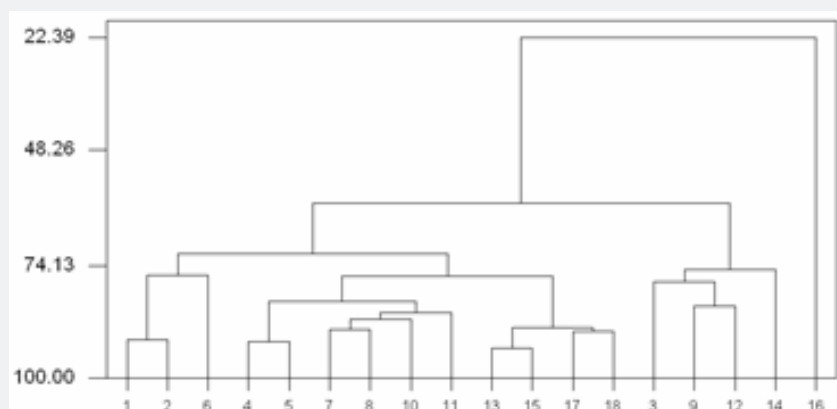
it seems that improving the functioning of ecosystems will be achieved if the increase in species diversity is accompanied by an increase in functional diversity of species. In this study, for both crops, all provinces of the country were classified into three groups in terms of weed diversity. In general, the diversity of weeds in wheat fields was more than sugar beet. Differences in crop management practices (fertilization and use of pesticides) are the most important determinants of weed species composition and consequently their diversity. Agronomical operations change the diversity, abundance and species composition of weeds.

**Table 1:** The codes for wheat and sugar beet fields across the Iran provinces.

Province	Code for Wheat Field	Code for Sugar Beet Field	Province	Code for Wheat Field	Code for Sugar Beet Field
East Azerbaijan	1	1	Sistan Baluchestan	13	-
West Azerbaijan	2	-	Fars	14	10
Ardabil	3	2	Qom	15	11
Isfahan	4	3	Qazvin	16	12
Ilam	5	4	Kordestan	17	-
Booshehr	6	-	Kerman	18	13
Tehran	7	5	Kermanshah	19	14
Charmahal o Bakhtiari	8	-	Kohkiluyeh boier-ahmad	20	15
Khorasan	9	6	Golestan	21	-
Khoozestan	10	7	Lorestan	22	16
Zanjan	11	8	Markazi	-	17
Semnan	12	9	Hamadan	-	18



**Figure 1:** Similarity of the provinces of the country in terms of all functional groups of weeds in wheat fields.



**Figure 2:** Similarity of the provinces of the country in terms of all functional groups of weeds in sugar beet fields.

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