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# Seed seedling relations in two very distinct *Aegilops* accessions

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## Abstract

The *genus Aegilops* includes about 20 identified species. At present, it is more and more accepted the idea that different *Aegilops*, as relatives of wheat, can serve as suitable materials in wheat genetic improvement. This is very important, especially in creating wheat lines or cultivars with high resistance to abiotic stresses and diseases. Researchers of the DPST, for several years continue the *ex situ* and laboratory evaluations on 24 *Aegilops* accessions collected in different areas of Albania, in order to evidentate some of their most interesting morpho physiological parameters. The ear weight, seed number, seed weight per ear and 1000 seeds weight for each *Aegilops* accession included in the experiment, have been evaluated. Beside these, the seeds imbibition potential and seedlings weight, height, leaf area have been evaluated, too. From the results of the numerous data processing, it is concluded that among the *Aegilops* accessions, included in the study, exist significant differences related their seeds and seedlings biometric parameters. For the most part of the evaluated parameters, the conical ear *Aegilops* accessions show advantages toward the cylindrical ones. Correlative analysis resulted in significant differences in the coefficients of correlation between seeds and seedlings parameters produced by *Aegilops* with distinct forms of the ear, respectively conical and cylindrical ones.

**Keywords**: *Aegilops*, conical/ cylindrical ear, correlations, imbibition.

## Introduction

Recently, a great interest continues to be focused to the genus *Aegilops*, which is closely related to *Triticum* constitutes an important source for wheat improvement. The genus *Aegilops* contains 23 species comprising both diploids and polyploids, which originated from the center of origin [18].

Numerous studies have been elaborated for the assessment of the genetic resources of wheat and its wild relative species, in particular those of the genus *Aegilops.* Unfortunately, the original habitat of cultivated wheat and wild cereals are destroyed or modified by several activities related to different industries and other human activities [4,13]. These affected the disappearance of numerous local varieties and species. Efficient strategy to solve loss of plant diversity consists of exploiting wild germoplasm genomes of wheat species, which preserve a good part of their adaptive factor and diseases tolerance [13]. The value of wild wheat relatives as a genetic resource for wheat cultivars improvement depends on the amount of genetic variability. The study of genetic diversity of the genetic resources of *Aegilops* may provide significant information regarding their potential for wheat breeding [19]. Genus *Aegilops L.* includes 11 diploids, 10 tetraploids and 2 hexaploides [12, 13]. From 23 types of *Aegilops*, most of diploides (*Ae. umbellulata Zhuk., Ae. mutica., Ae. bicornis (Forssk.*) Jaub. & Spach, Ae. searsii Feldman & Kislev (Hammer), *Ae. caudata L., Ae. sharonensis Eig, Ae. speltoides Tausch, Ae. longissima* Schweinf. & Muschl. some poliploides (*Ae. ventricosa Tausch*, *Ae. peregrina* Hack. N. J. Fraser, Marie & Weiller, *Ae. geniculata Roth*, *Ae. boiss kotschyi., Ae. biuncialis L.)* have been used for developing Wheat – Aegilops *Lines*. These species have many genes of agronomic interest and they can be important sources for resistance to disease, pests and extreme environmental factors. However, other useful traits in *Aegilops* could be identified and used in wheat breeding [9,10].

Types of *Aegilops*, that are closely related to wheat, exhibit greater genetic diversity, the exploitation of which has been the subject of experimentation for many years [13]. In recent years interest being shown for the wild relatives of wheat [12]. This refers to the ability to make classical taxonomic studies, cytological and evolutionary studies, as well as the application of the methods chromosomal and genetic engineering in cultivated forms, in order to inclusion ones as many desirable features [11]. The wild relatives of bread wheat, *T. aestivum* L., are considered as potential sources of useful alleles for bread- wheat improvement [2, 3]. The aim of this study is to find out if the *Aegilops* accessions collected in different parts of Albania show any variability for ears, seeds and seedlings morphological and physiological parameters.

## 2. Material and Methods

The plant material consists in 24 accessions of *Aegilops* collected in different regions of Albania during the expeditions performed as part of a biodiversity identification and conservation project [1,5,6,15,16]. The experimental probes established on *Aegilops* collection at AUT "Xhaferr Qosja" Botanical Garden during 2012-2016.

The measurements are performed on eight *Aegilops* accessions, four with conical ears and four with cylindrical ones (see table 1).

The studied parameters include ear characteristics like ear length, ear weight, number of grains per ear, 1000 grains weight and seeds imbibition potential. The seedling characteristics evaluated are: seedling weight, seedling height, the first leaf length and leaf area. The description of material collected was based on morphological studies of spikes descriptions [7,10,18]. The analysis of variance are performed for all parameters measured and the correlations among different parameters are evaluated, too.


**Figure** 1. The Administrative Map of Albania.

**Table** 1. The *Aegilops* accessions named according regions where were collected.

| No. | Accession | No. | Accession |
|---|---|---|---|
| 1 | Ardenica 5 | 14 | Peshkëpi 5/13 |
| 2 | Divjakë 5/1 | 15 | Barmash 227 |
| 3 | Pojan 5/2 | 16 | Drenovë 228 |
| 4 | Patos 5/3 | 17 | Qafë thanë 229 |
| 5 | Borsh 5/4 | 18 | Xibrakë 230 |
| 6 | Lukovë 5/5 | 19 | Elb. (perif) 163 |
| 7 | Bistricë 5/6 | 20 | Shushicë El. 160 |
| 8 | Zhiton 5/7 | 21 | Qafë Krrabë 161 |
| 9 | Tërpan 5/8 | 22 | Gjinas El. 162 |
| 10 | Tomorr 5/9 | 23 | Razë- Krujë 164 |
| 11 | Bargullas5/10 | 24 | Priskë 165 |
| 12 | Ardenicë 5/11 | 25 | Mat. Njohur |
| 13 | Patos 5/12 | 26 | Mat. Njohur |

**Figure** 2. Views from different aspects of experimental work on *Aegilops* accessions of collection *at AUT Botanical Garden and Plant Physiology Laboratory.*

## 3. Results and Discussion

The morphological parameters data processing show relatively wide variations exist among *Aegilops* accessions evaluated. Some very interesting data are that related spike components, where are included ear number per plant, ear length, ear weight, the number of grains per ear, grain length and grain weight. The variance analysis show that, almost, for all parameters mentioned above, the found differences are statistically verified. Significiant differences exist for seedlings height, seedling weight, first leaf length and leaf area, too.

### *3.1 The comparison of Aegilops accessions for ears and grains*

Analysis of variance of the parameters of the ears and grains of *Aegilops* accesions, as well as the presentation of the respective averages in the following histograms, reveal marked differences among accessions with conical ears (3,14,16,26) and those with cylindrical ones (10,15,22,25). The conical ears *Aegilops* accession have the ear weight, seeds weight per ear and 1000 seeds weight higher than cylindrical ears ones. On the other side, cylindrical ears accessions have the seeds number for ear higher than accessions with conical ears. These results are similar to those found earlier [8].

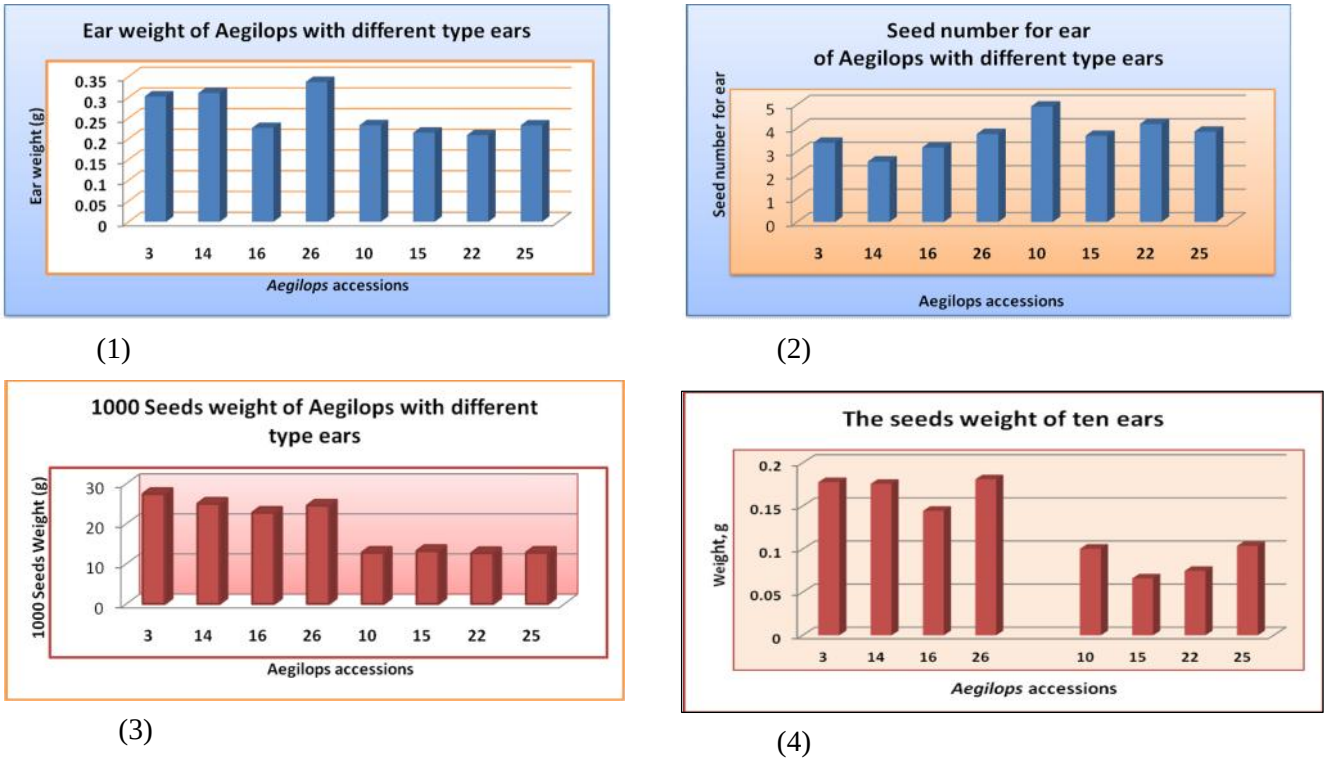
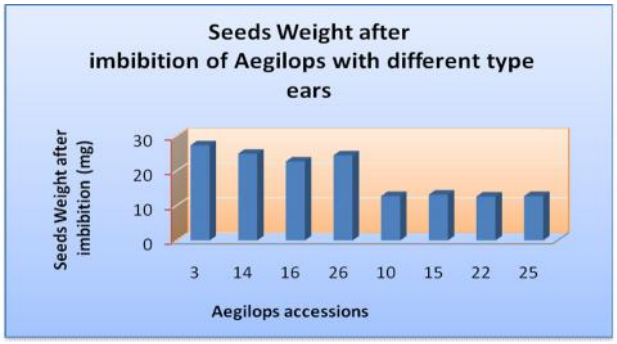


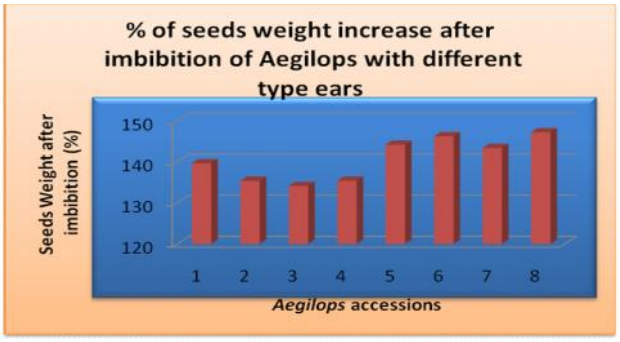

**Figure** 3. The histograms of mean values of some ear and grain characteristics for eight Aegilops accessions (3, 14,16, 26 with conical ears and 10, 15, 22, 25 with cylindrical ears): ear weight (1); seed number for ear (2); 1000 seeds weight (3) and seed weight per ear (4).

### *3.2 The comparison of different type ears Aegilops accessions for seed imbibition capacity*

The data processing of seeds weights before and after imbibition showed that conical ears accessions continue to be heavier than those with cylindrical ears Figure 4a, but the latter had the higher increases (%) of their weights Figure 4b. This difference should be related to a high capacity of seeds from cylindrical ears *Aegilops* accessions to imbibe more water. They seem to have a matric potential higher than conical ears accessions [14, 17].




(a)




(b)

**Figure** 4. The histograms show the mean values of seeds weight after imbibition (a) and the % of their dry weight increases for eight *Aegilops* accessions; 3,14,16,26 with conical ears and 10, 15, 22, 25 with cylindrical ears.

*3.3 Seedlings weight and seedlings growth* dynamics

The seedlings originated from seeds of conical ears *Aegilops* accessions are heavier than the seedlings came from seeds of cylindrical ears accessinons. The analysis of variance resulted in significant differences among them. The histograms below show the average weights of the *Aegilops* accessions evaluated.

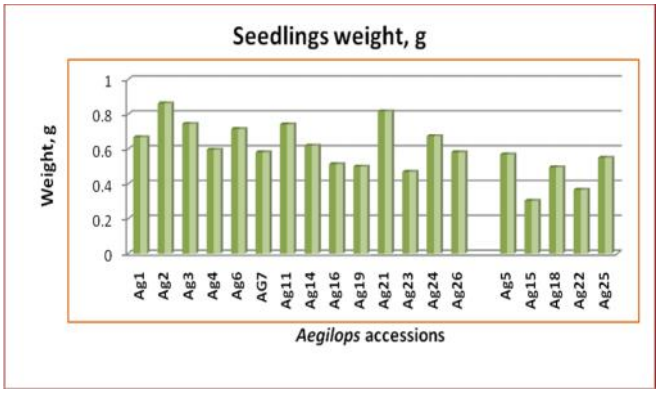



**Figure** 5. The average weights of the *Aegilops* accessions evaluated.

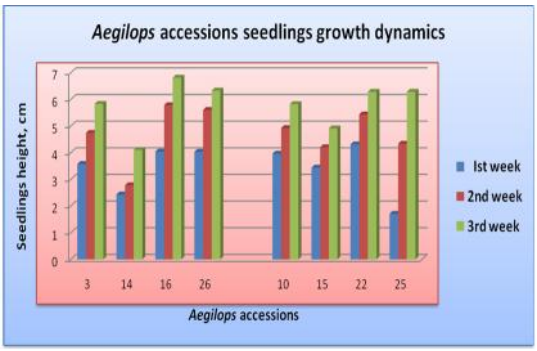



**Figure** 6. *Aegilops* accessions seedlings growth dynamics during first three weeks after germination.

It is evident that during first three weeks after germination the differences of growth dynamics among two types of *Aegilops* accession come diminishing from the first week to the second and the third one. It seems that the differences originated more from their seeds than their shoots photosynthetic activity.

*3.4 The correlations among seeds and seedlings different parameters*

The graphics below show the relations among different seed parameters during germination, separately, for conical ears *Aegilops* accessions and cylindrical ones. The $R^2$ values of both types of *Aegilops* accessions are almost similar.

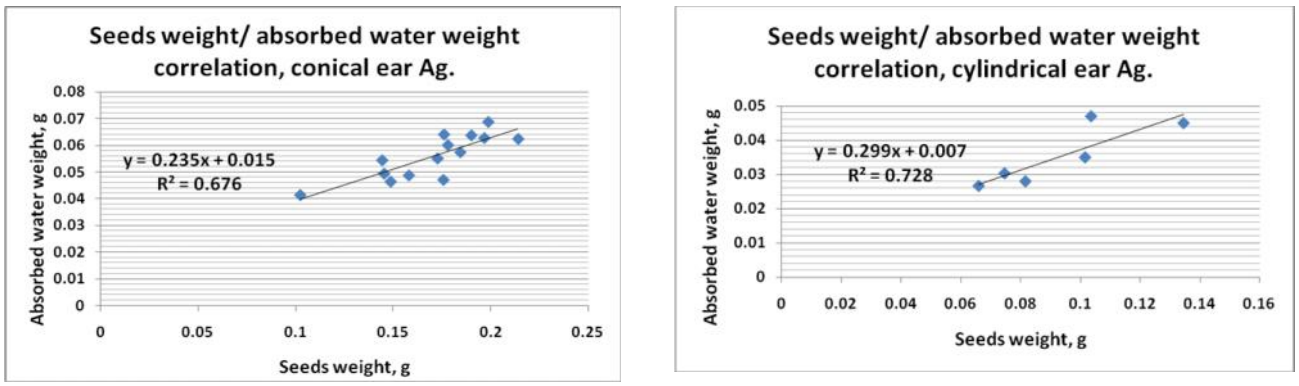



**Figure 7**. Seeds weight/ absorbed water weight correlation in conical and cylindrical ears *Aegilops* accessions.

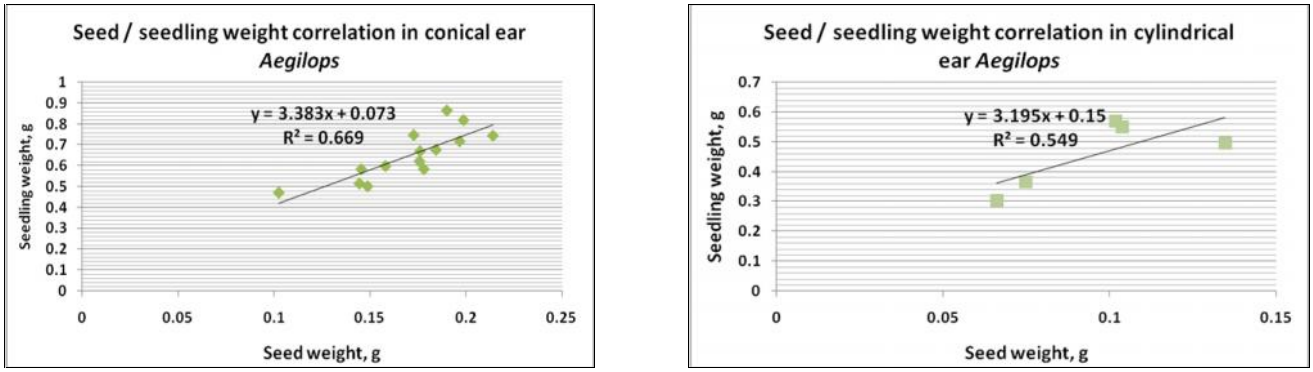



**Figure 8.** Seeds weight/ seedlings weight correlation in conical and cylindrical ears *Aegilops* accessions.

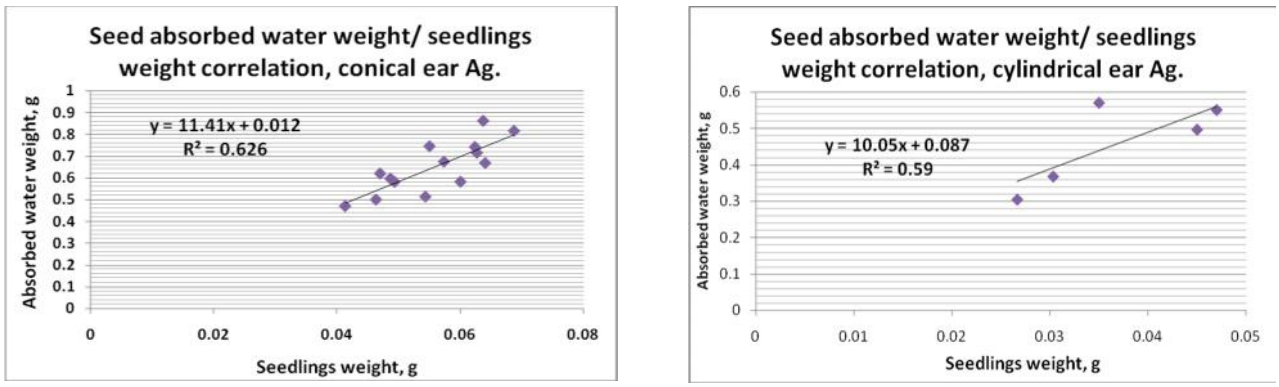



**Figure 9**. Seeds absorbed water weight/ seedlings weight correlations in conical and cylindrical ears *Aegilops* accessions.

The values of $R^2$ from the graphics above show that among two types of *Aegilops* accessions exist differences in the way how the seeds weight influence the seedlings weight. This influence is greater in conical ears Aegilops.

The $R^2$ values from the graphics above show that seeds absorbed water weight/seedlings weight correlation is positive and relatively strong for both types of *Aegilops* accessions.

## 4. Conclusions

The results of the numerous data processing show that among the *Aegilops* accessions, included in the study, exist significant differences related their seeds and seedlings biometric parameters.

For the most part of the seeds evaluated parameters, the conical ear *Aegilops* accessions show advantages toward the cylindrical ones; they have the ears weight, seeds weight per ear and 1000 seeds weight higher than cylindrical ears ones. On the other side, cylindrical ears accessions have the seeds number for ear higher than accessions with conical ears.

The seeds of cylindrical ears *Aegilops* accessions have the higher increases (%) of their weights after imbibition.

The seedlings originated from seeds of conical ears *Aegilops* accessions are heavier than the seedlings came from seeds of cylindrical ears accessinons, however after three weeks growth, the differences among their heights are statistically not important.

Correlative analysis resulted in significant differences in the coefficients of correlation between seeds and seedlings parameters produced by *Aegilops* with distinct forms of the ear, respectively conical and cylindrical ones.

## 5. Acknowledgements

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