

DISTRIBUTION OF *TRITICUM BOEOTICUM* SSP., *THAODAR* AND ITS ASSOCIATES (*AEGILOPS* SPP.) IN IRAN

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Abstract

The wild wheats of Iran are considered as original genetic sources that could be used for improvement of the cultivated wheat. *Triticum boeoticum* ssp. *thaouidar* (syn. *Triticum thaouidar*) and its associates, as one of the best living collection of the wild wheats, could play a major role in this regard. The distribution of *Triticum thaouidar* and its associates are described.

Introduction

Diploid wild wheats of Iran viz., *Triticum boeoticum* ≡ genome AA, *Aegilops speltoides* ≡ genome BB??, *Aegilops squarrosa* ≡ genome DD are considered as original genetic sources that could be used for improvement of the cultivated wheat (hexaploid species consisting genomes: AA+ BB+DD) (Rahimi Nejad, 1997; Mohammadi, 1997). The habitats of wild wheats in the west of Iran (east of fertile crescent) are potentially the ideal areas to explore the suitable genes for further transferring into the cultivated wheat (Bazgir, 2000; Van Slageren, 1994). Despite the importance of wild wheats of west of Iran in plant breeding, there is a very limited information in this regard. Thus, the most important activity of the gene bank of Iran is data collection about wild wheats of west of Iran (Vejdani, 1993). Since there is a special correlation between the diversity of wild wheats and of their habitats (Pecetti, 1999), and the fact that utilization of these natural sources is one of the main aims of establishing the sustainable agriculture (Plucknett, 1987), there is need to study the distribution of wild wheats, like *Triticum boeoticum* ssp. *thaouidar* which is the most wide spread basic wild wheat (genome AA) in the west to centre of Iran (Termeh, 1975; Tabatabaei, 1997).

The present report describes the distribution of *Triticum thaouidar* and its associates (principally *Aegilops* spp.) over an area from in the west towards north and centre of Iran.

Materials and Methods

A path from Talegham to Yasuj with 20 main intervals was extended throughout the area (Fig. 1). Along this path and subsidiary paths, *Triticum thaouidar* habitats were identified and marked. Among these, 100 populations (habitats) with sufficient "sociability" and "abundance" were selected (Table 1) which were new, climatically very similar (but edaphically somehow different) and according to the climatograms (Bazgir, 2000) were categorized as cold to high-cold: always in boundaries between arid to humid. These habitats were generally in altitudes between 1100 m to near 3000 m. The floristic composition of the habitats was studied using the Braun-Blanquet method (Braun Blanquet, 1983). The collected data of this study were firstly manured by M. Atri arrangement (Atri, 1996); then analyzed and classified by "Gounot" method (Gounot, 1978) and "anaphyto" software (Briane, 1992).

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Fig. 1. *Triticum boeoticum* Boiss. ssp. *thaoukar* (Reut.) Schieman

A. # 1, habit, x 3; 2, ligule, x 3; 3, grain, x 2. B. The path with twenty main intervals where the plant was studied in Iran. Some intervals are marked (1, 2, 6, 12, 16, 18).

Results and Discussion

Among 17 wheat species existing in Iran (Rahimi Nejad, 1997; Mohammadi, 1997), only two were not observed in the 100 habitats. It was also revealed that in 83 habitats of 100 habitats *Aegilops* spp., were in association with *Triticum thaoudar*, whereas in only 3 habitats (last ones) *Triticum* spp., were in association with *Triticum thaoudar* (i.e., nearly all wild wheats associated with *Triticum thaoudar* are species of *Aegilops*). However, in 16 habitats no wild wheats (neither *Aegilops* spp., nor *Triticum* spp.) was in association with *Triticum thaoudar*.

Considering all floristic compositions, 7 groups (syntaxa) were ordinated. The distribution of the 100 populations (habitats) in 7 groups does not follow an exact geographical order i.e., in each group there are similar habitats from different areas that have closer endogenic vegetation. Each group can also be identified by special structural pattern of the morphology of spikelet and its second awn (Fig. 2). A model of these structural patterns (the last one), is the main criterion in distinction between *Triticum thaoudar* and its close species *Triticum boeoticum* (Bor.1970; Mobayen, 1980). From two spikelet awns, the size of one of which varies in different types of *Triticum thaoudar* which gradually become shorter towards colder climates. This awn is so small in the last type that makes it very similar to *Triticum boeoticum*. These two species are therefore considered nearly as the same viz., *Triticum monococcum* L. ssp. *aegilopoides* (Link) Thell., and these two themselves are comparable with *Triticum monococcum* ssp. *monococcum* (Van Slageren, 1994; Guy, 1998).

The *Aegilops* species of Iran (14 species), from the view points of the present report, can be classified into 4 groups:

- A. Two species of *Aegilops* viz., *Aegilops caudata* (syn. *Triticum dichasians*) growing in warm areas of west of Zagross and *Aegilops lorentii* (syn. *Aegilops hiuncialis*, syn. *Triticum macrochaetum*) growing in semi - mediterranean environment of Moghan, because of climatical condition cannot survive in cold climate of *Triticum thaoudar* habitats.
- B. Three species of *Aegilops* viz., *Aegilops triuncialis* (syn. *Triticum triunciale*), *Aegilops cylindrica* (syn. *Triticum cylindricum*) and *Aegilops triaristata* (syn. *Triticum triaristatum*) (with frequencies: 65%, 32%, 15%) have high association with *Triticum thaoudar* (Table 1). Since the 100 selected habitats in this research are located in cold climate and *Aegilops triuncialis* is more frequent in other areas of Iran with warm climate, thus climatical adaptation of this species is higher than other *Aegilops* species.
- C. Due to the association (frequency: 5%) of two species, viz., *Aegilops squarrosa* (syn. *Triticum tauschii*) and *Aegilops kotschyi* (syn. *Triticum kotschyi*) with *Triticum thaoudar*, they can be considered as the "normal" species in their habitats. The first species has limited distribution (Table 1), whereas the second species has not limited distribution. Therefore, *Aegilops tauschii* may be known even as a "characteristic" species in its habitats.
- D. The other *Aegilops* species that have a little association with *Triticum thaoudar* (maximum frequency: 2%), are called "transgressive" species which come from local flora to the wheat habitats.

Morphological changes of spikelet (awn) in
Triticum boeoticum ssp. *thaoudar* (Reut.) Schiemann (syn. *T. thaoudar* Reuter)

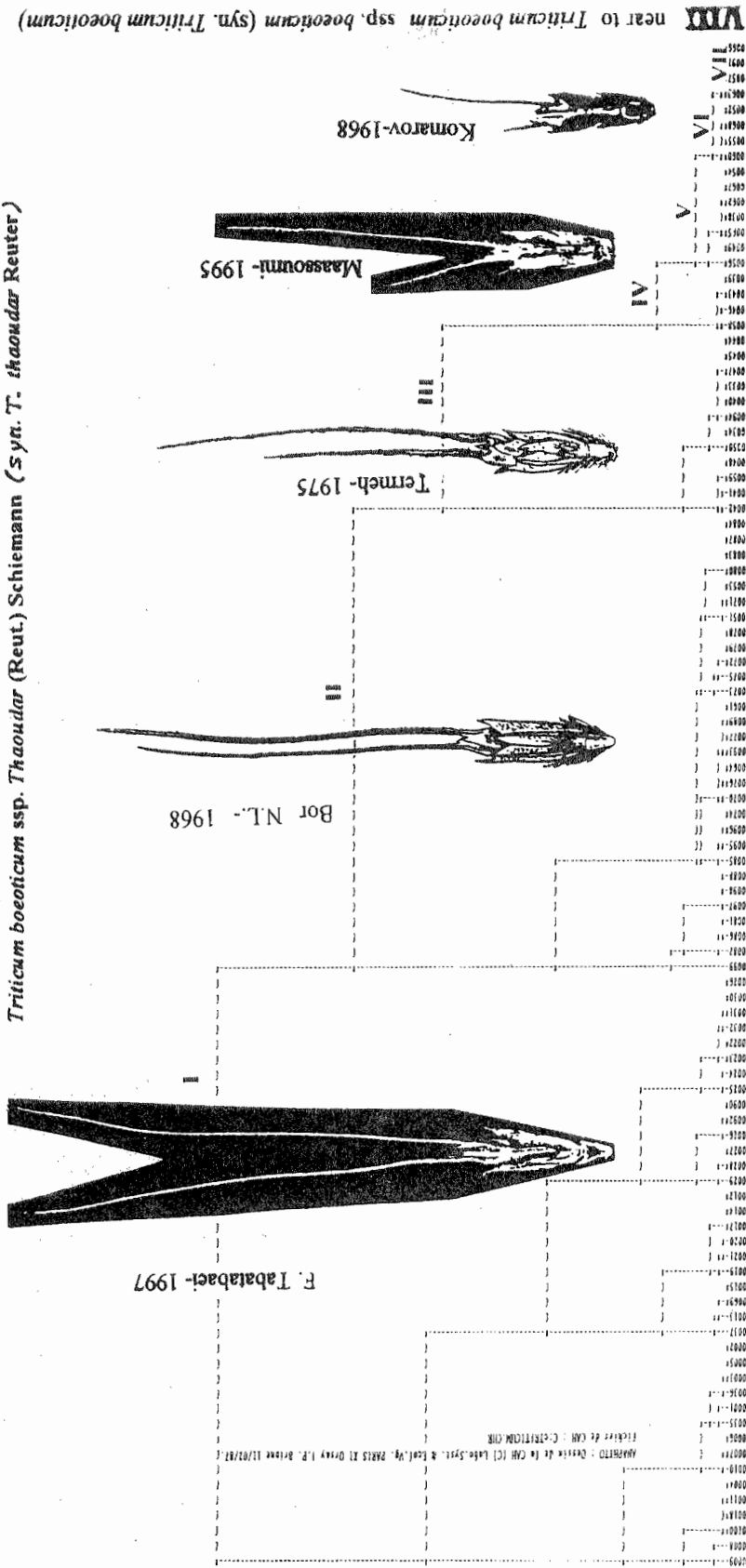


Fig. 2. Ascendant Hierarchic classification (A.H.C.) of *Triticum thaoudar* based on botanical traits, according to the cluster method of "ANAPHYTO" software (Briane, 1987).

Table 1. Wild wheats, associated with *Triticum thaouadar* in its habitats in Iran.

	Taleghan	Alamoot	Alamoot- Kalkal	Kalkal- Ardabil	Ardabil- Kahbar	Kahbar- Ahar-Sahand	Sahand- Urmia	Urmia- Piranshahr	Piranshahr- Sardast	Sardast- Baneh	Frequency
<i>Ae. triuncialis</i>	1-3	10,11	13,16	17,18,19	22-25	26,29-32	36-38	42-45	46,48-50	47	53-55
<i>Ae. cylindrica</i>	1,2	10		17	24,25	26,27,30,31	33-36,39	42-45	46,48-50		52-55
<i>Ae. triaristata (neglecta)</i>		11	16		25	26-29					51,54
<i>Ae. kotschy (& pregrina)</i>					?	31					
<i>Ae. squarrosa (T. tauschii)</i>					24,25	26,27,32					
	Baneh	Mariyan	Mariyan- Ravanser	Ravanser- Ivan	Ivan- Kermanshah	Kermanshah -Alastar	Alastar- Koramabad- Allgoodarz	Allgoodarz- Shahrekind- Semriom	Semriom- Yasuj		
	56-63	64-67	68-71	72-76	76-83	84-88	89-92	93-96	97-100		
<i>Ae. triuncialis</i>	57-63	64-67	68-71	74-76	77-83	84-88	89,90-92	96	97		65
<i>Ae. cylindrica</i>	56,62	66	70	72			90-91				32
<i>Ae. triaristata</i>	57	66		71-74	79	86					15
<i>Ae. kotschy</i>	56	?									5
<i>Ae. squarrosa</i>											5
<i>Ae. crassa</i>				74	83						
<i>Ae. speltoides</i>		65,67									2
<i>Ae. juvenalis</i>											2
<i>Ae. columnaris</i>			71								1
<i>Ae. ovata (geniculata)</i>											1
<i>Ae. umbellulata</i>					80						1
											1
											1
											1
											1
											1
											1
											1

Ae. ovata (geniculata) is in the habitat No. 18

Triticum boeoticum is in the habitat No. 92

Triticum monocoecum is in the habitat No. 98

Triticum dicoccoides is in the habitat No. 99

The results of the present studies also suggest that the populations of *Triticum thaouudar* (and its associates) are closer together and more pronounced in continuity in some western parts of Iran particularly Kurdistan, Kermanshah and Lorestan provinces that are in line with the eastern parts of "fertile crescent" (Tarous-Zagross). Meanwhile, from west towards north and center, these populations become less continuous so that they gradually become part of the rare species in these areas. *Triticum thaouudar* could therefore be found even in the cold eastern parts of Iran.

Despite the earlier report of Parsa (1951), no sample of *Aegilops speltoides* were found in southern parts of west of Iran (e.g., in intervals lower than Lorestan Province) which could be due to human made changes in last 40 years. Since the greatest accumulation of wild wheat species (6-7 species) was observed in the intervals of "Kalibar- Ahar" (Arasbaran) and "Baneh- Marivan", these two must be considered as the "richest wheat gene pool" in Iran. The smallest accumulation of wild wheat species (only *Triticum thaouudar*) was observed in the central intervals.

In the different types of *Triticum thaouudar* (in the seven groups which were found in this study), characteristics such as baking value, nutritive component, resistance to stresses etc., may not be the same. If biochemical and molecular studies on these characteristics are carried out, different useful economical traits of the types of this wild wheat may be revealed which will also verify and recommend the efficiency of the modern methods of phytosociology for syntaxa classification and phytotypes determination.

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