



# Characterization of *Aegilops sharonensis* populations

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- *Aegilops sharonensis* (Gramineae) is a wild relative of cultivated wheat. It belongs to the Sitopsis section of the genus *Aegilops*, which possesses the S'S' genome, which is closely related to the B genome of bread and durum wheats. It is sufficiently related to wheat to allow hybridization, yielding a low rate of seed set of the F<sub>1</sub> hybrids and thereby may be exploited for wheat improvement.
- *Aegilops sharonensis* is endemic to the coastal plain of Israel and South Lebanon. Accelerated development including urbanization and road construction along the coastal plain, causes the natural habitats of this species to diminish. Therefore many populations are on the edge of extinction.
- The Lieberman Gene Bank in Tel-Aviv University maintains a collection of about 2,000 accessions (single spike origin) of *Ae. sharonensis* from 30 locations throughout the area of distribution of the species. This is the largest existing collection of this species (and other Sitopsis species).
- Ecological, molecular and phytopathological characterization of this collection enables us to understand the population structure and to determine future collection strategy. Moreover, revealing of resistance to wheat diseases provides another under utilized gene pool for improvement of commercial wheat cultivars.



A spike of *Aegilops sharonensis*

## A. Collection

*Ae. sharonensis* specimens have been collected since 1981. In 2003 and 2004, a comprehensive survey was made in order to locate new collection sites and map the area of distribution of the species.

The species grows on sandy soils and stabilized dunes, occurring mainly along the coast. Yet, some populations were found relatively distant from the coast line (Petah-Tikwa, 20 Km), and some grow on red sandy loam. The collection sites were located mostly in primary habitats, but some also in disturbed habitats, like field edges and road sides. Especially large populations were found at Shefayyim, Palmahim, Ashdod and Karmiyya sites.

Collection sites of *Ae. sharonensis* along the coastal plain of Israel



Abbreviations for the population names:

MIF	Ein HaMifraz	PET	Petah Tikwa
YAM	Newe Yam	ONO	Qiryat Ono
HEF	Hefzi-Bah	PAL	Palmahim
MIK	Mikhmoret	ZAK	Ben-Zakkay
NET	Netanya	ASH	Ashdod
SHE	Shefayyim	KAR	Karmiyya

Typical habitats

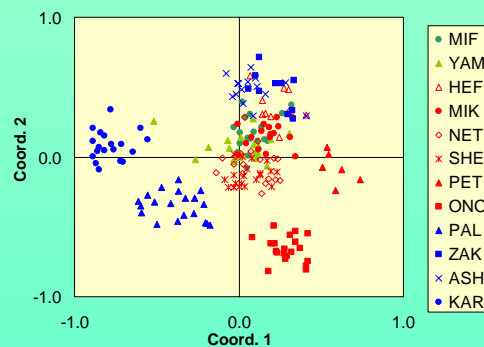


1. Typical habitat: on the coast, stabilized dunes. Newe Yam.
2. Close proximity to the coast line. Nahsholim.
3. Sandy hill near Rishon LeZiyyon. Mixed with *Aegilops longissima*.
4. Disturbed habitat near Kishon port.
5. *Acacia albida* grove. Ashdod nature reserve.

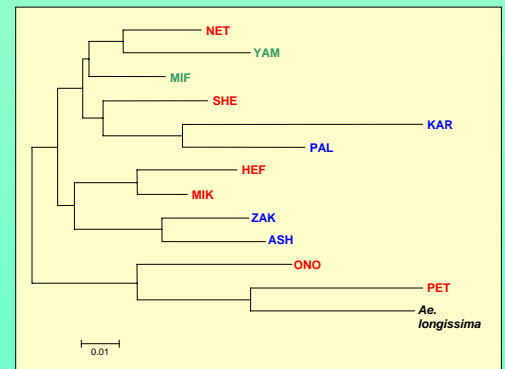
## B. Molecular characterization

236 accessions of *Ae. sharonensis* from 12 collection sites were characterized using AFLP markers. They were compared to 40 selected accessions of *Ae. longissima* (another Sitopsis species possessed the S'S' genome) from several locations. Genetic distances among individuals and among populations were calculated based on 185 polymorphic markers, resulting from three AFLP primer combinations.

1. Principal coordinates analysis of genetic distances among accessions of *Ae. sharonensis* (marked by population). The populations are colored by geographical region: north (green), center (red), and south (blue) of the coastal plain.



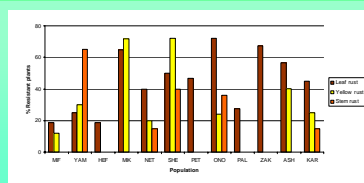
2. Genetic distances among *Ae. sharonensis* populations and *Ae. longissima*



- Individual plants from the same population are clustered together.
- Some populations are distinct from each other and some are situated together.
- A partial differentiation between the northern, central and southern populations is reflected in the genetic distances.
- PET and ONO, which are the eastern-most populations, are genetically distant from the other *Ae. sharonensis* populations. Both grow near *Ae. longissima*, and a probable gene flow from this species is apparent morphologically and phenologically on individuals from PET, but not from ONO.

## C. Resistance to cereal rusts

The response of *Ae. sharonensis* populations to three wheat rusts: leaf, yellow and stem rusts was recorded following seedling inoculation. The figure shows percentage of resistant accessions from each population. For yellow and stem rusts, only partial data is available.



- Resistance to leaf rust and yellow rust was found in all *Ae. sharonensis* populations studied. High levels of resistance were found to: leaf rust – MIK, ONO, ZAK; yellow rust – MIK, SHE; stem rust – YAM.
- This species can serve as a potential source for introgression of new rust resistance genes to cultivated wheat.

## Conclusions

The clustered population structure of *Aegilops sharonensis* suggests that future collection will concentrate on sampling of more populations and less samples from each.

The differences in resistance responses between populations strengthen our first conclusion.