

INSTITUTE
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Chickpea cultivar mixtures to improve yield stability

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Chickpea- an interesting crop

- Chickpea is a leguminous crop and a protein source for humans and animals.
- Nitrogen fixation -> soil health
- Low impact crop -> good for the environment



What does it mean chickpea cultivar mixtures?

Cultivar mixtures are the simultaneous cultivation of two or more cultivars of the same crop species in the same field, mixed together, rather than planted in separate fields.

They differ in their **genetic background**, which gives:

- differences in adaptation to soil and climate,
- variation in resistance/tolerance to stresses (pests, drought, diseases),
- differences in yield and quality.



Studying functional traits..

Such as: disease resistance or drought tolerance but not only..



Creating cultivar mixtures..

VAR 1(funcional traits):

- high yield
- erect habitus

VAR 2(funcional traits):

- Fusarium* resistance
- habitus semi-erect
- highly susceptible to *Ascochyta*
- low yield

MIX

VAR 3(funcional traits):

- Drought tolerance
- Fusarium* susceptible
- prostrate habitus

VAR 4(funcional traits):-

- Ascochyta* moderate resistance
- low height
- Drought susceptible



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A short overview of the main chickpea fungal diseases:



Fusarium oxysporum f.sp. *ciceris*



Ascochyta rabiei

Short activity:

Each group receives:

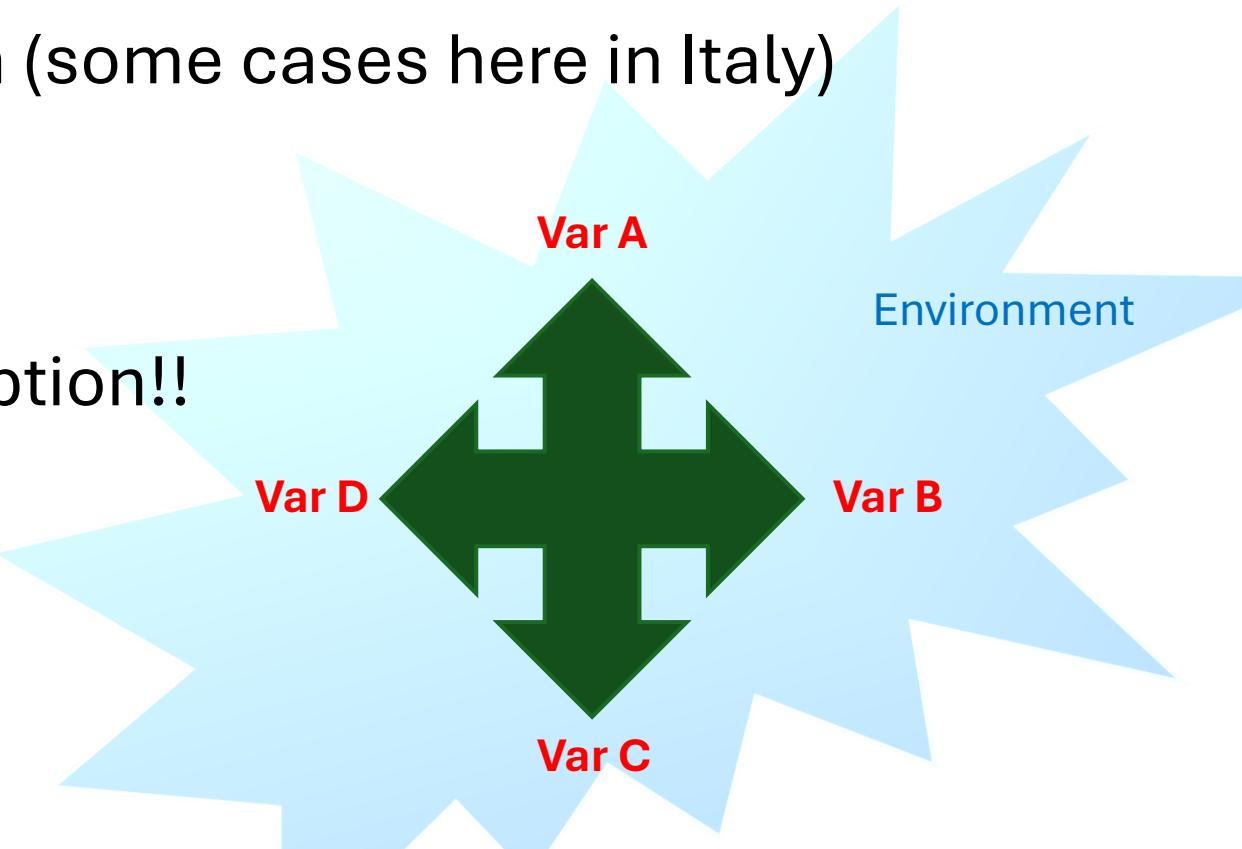
-10 variaties to choose from

-1 specific environmental condition (some cases here in Italy)



Try to create your best **4-mixture** option!!

(Time: max **15 minutes**)



Environmental condition



	SOIL (heavy soil)	PRECIP.	UMIDITY	TEMP.	WEEDS	ANNUAL CLIMATIC VARIETION
PO VALLEY	●●●	●●●	●●●	●●	●●●	●●●
TUSCANY HILL	●	●●	●●	●●	●●	●●●
ABRUZZO HILL	●●	●●	●●	●●	●●	●●●
SICILY REGION	●	●	●	●●●	●	●●

●●●: Max

●●: medium

● : min

Where can we find our chickpea in Italy?

Po Valley

Soil: Clayey and silty soils, well-structured but susceptible to waterlogging.

Precipitation: Annual levels between 800 and 1,200 mm, irregularly distributed throughout the year.

Humidity: High relative humidity, especially in spring and autumn, which can promote the development of fungal diseases.

Weeds: Strong competition with the crop.

Diseases: Frequent attacks of *Ascochyta rabiei* (chickpea blight) and *Fusarium* spp.

Annual variations: Variable climatic conditions can influence the frequency and intensity of pathogen and weed attacks. Cold winters and hot, dry summers.



Tuscany hill

Soil: Calcareous, well-drained soils.

Precipitation: Annual levels between 600 and 900 mm, with hot and dry summers.

Humidity: Generally low relative humidity, except during periods of intensified rainfall.

Weeds: Competitive weeds if spring rains occur.

Diseases: Moderate risk of *Ascochyta rabiei*, but frequent in wetter years.

Annual variations: Particularly hot and dry summers can reduce chickpea growth and yield.



Where can we find chickpea in Italy?

Sicily

Soil: Sandy and calcareous, well-drained soils with alkaline pH.

Precipitation: 400–600 mm/year; long, hot summers ($T > 35^{\circ}\text{C}$) and mild winters.

Humidity: Generally low relative humidity.

Weeds: Moderate competition.

Diseases: Moderate risk of *Ascochyta rabiei* and *Fusarium* spp.

Annual variations: Some years may experience heavier rainfall or localized storms.



Abruzzo hill

Soil: Clay-limestone, with good water-holding capacity.

Precipitation: 700–1,000 mm/year, irregularly distributed; heavy summer storms possible.

Humidity: Moderate, with frequent morning fogs in spring and summer.

Weeds: *Chenopodium* spp., *Solanum* spp., *Centaurea* spp., competitive species in wetter soils.

Diseases: Higher risk of *Ascochyta rabiei* and root rots in rainy years.

Annual variability: Rainier years favor fungal diseases and weed infestations; dry summers can stress plants but reduce some diseases.



FUNCTIONAL TRAITS OF OUR VARIETIES

	Fus res.	Asco tol.	Drought tol.	Heat tol.	Yield	Canopy height	Canopy cover
VAR. 1	●●●	●	●●	●	●	●●	●
VAR. 2	●	●●●	●	●	●	●	●●
VAR. 3	●	●	●●●	●●	●●	●	●●●
VAR. 4	●●	●	●	●●●	●●	●●	●●
VAR. 5	●	●	●●	●●	●	●●●	●
VAR. 6	●	●●	●	●	●●●	●	●●
VAR. 7	●	●●	●●●	●●	●	●●	●●
VAR. 8	●●	●	●●	●	●●●	●●	●●
VAR. 9	●●	●●	●	●	●	●●●	●●
VAR. 10	●●●	●	●	●●	●●	●●	●

●●●: Max

●●: Medium

●: Min

**Why did you choose these varieties in your mix?
DISCUSS TOGETHER!**



Just a brief reflection/space of dialogue:

**When is it better to use an improved variety,
and when should cultivar mixtures be used?
What are the pros and cons of using them?**



vs



Thank you for your participation!



Follow us and our project here!