

Exploiting the *supermale x environment* interactions for breeding early all-male asparagus varieties

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Family owned business since 1887: Darbonne family 5th generation

Activities and Missions:

- 1/ **Breeding:** Research & Development of new varieties
- 2/ **Nursery:** Production of nursery stock & seeds
- 3/ **Fresh Produce:** Grower, Packer & Shipper

Planasa varieties in the world represents

- 7.500 ha of Berries production
- 6.000 ha of Asparagus production**
- 20.000 ha of Garlic production
- 2.500 ha of Stone fruit production

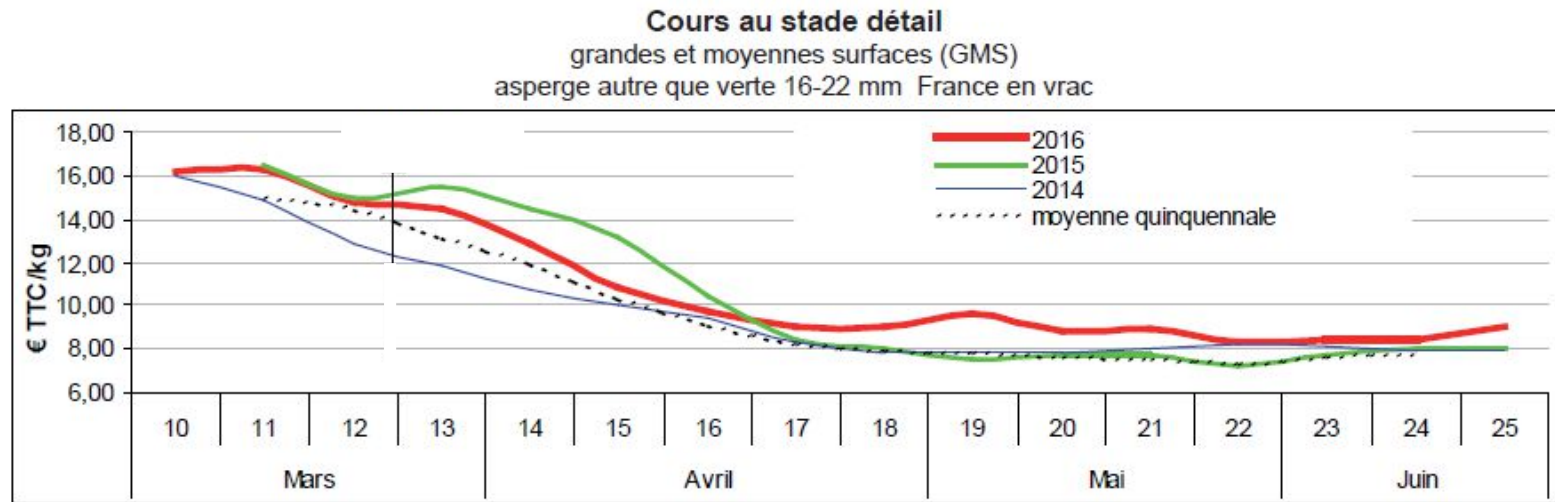
Planasa grows in the world

- 423.000.000 Berries plants (700 ha of nursery)
- 15.000.000 Asparagus crowns**
- 2.000.000 kg of Garlic seeds (150 ha of production)
- 750 ha of Fresh produce crops

Committed to
The farmer's needs
&
The consumer's taste

Improving asparagus variety earliness

Economic challenge for growers = better price



(RNM, 2017)

→ Improvement of earliness allowed by all-male effect and breeding progress

→ Do supermale lines permit to improve earliness of their descendance?

Earliness evaluation: definition

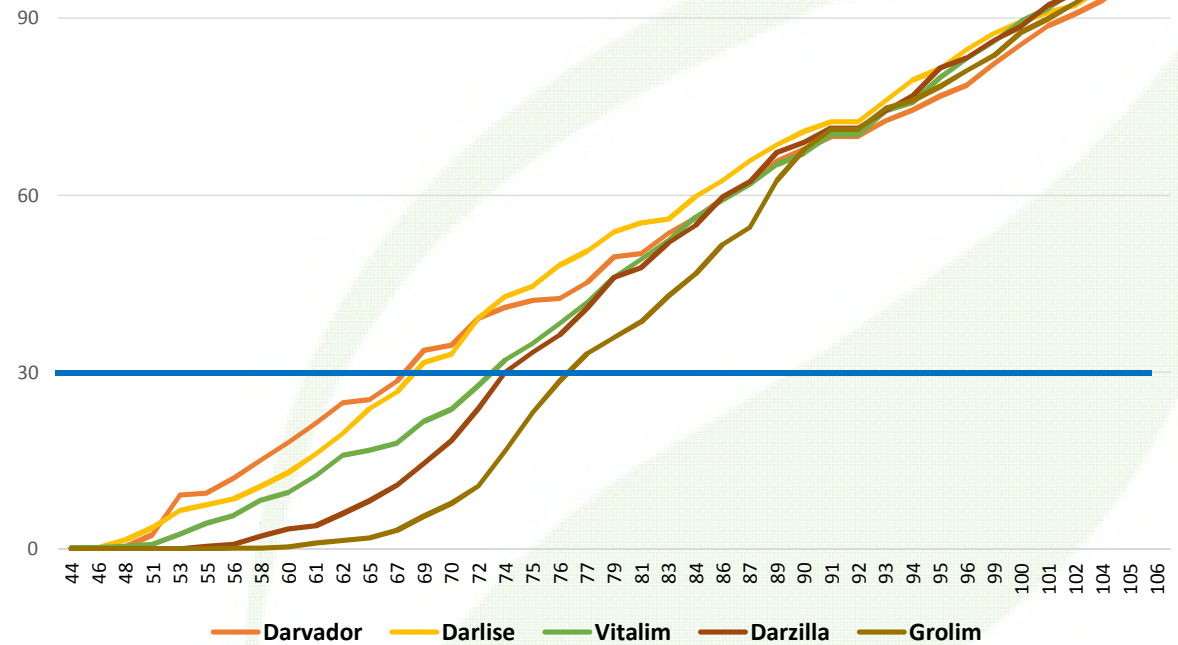
Earliness = ability to produce early on the year **and** to have the majority of the production early

Faedi index

$$\frac{\sum_1^i nigi}{[gtot]}$$

ni : quantil date of the day of picking *i*
gi : yield (gross weight per hectare) of the day of picking *i*
gtot : total yield (gross weight per hectare)

Relative cumulated yield (en %)

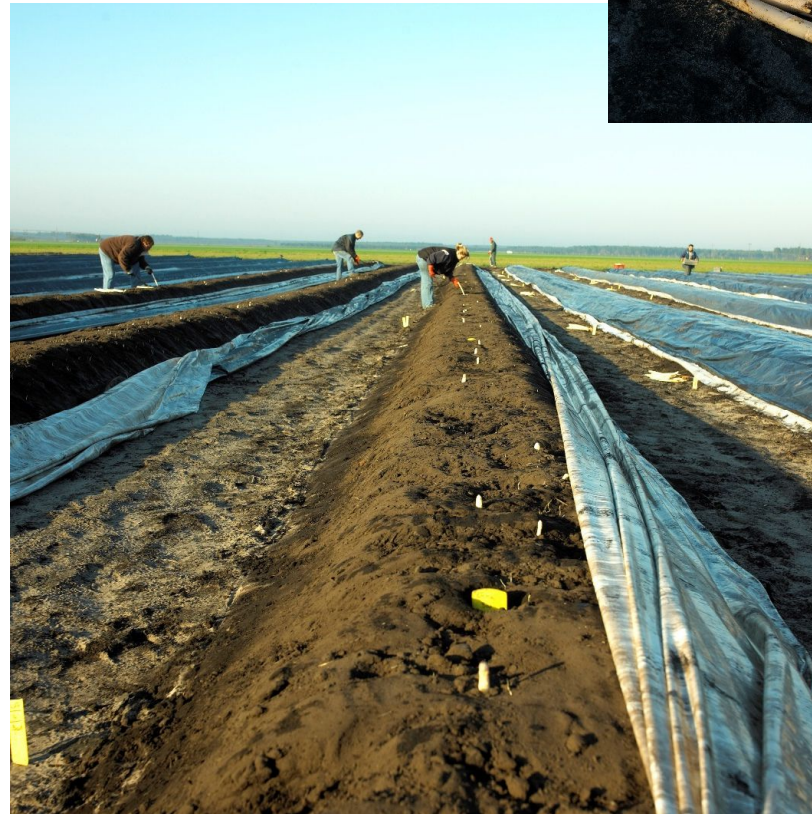


Planasa station, 2017

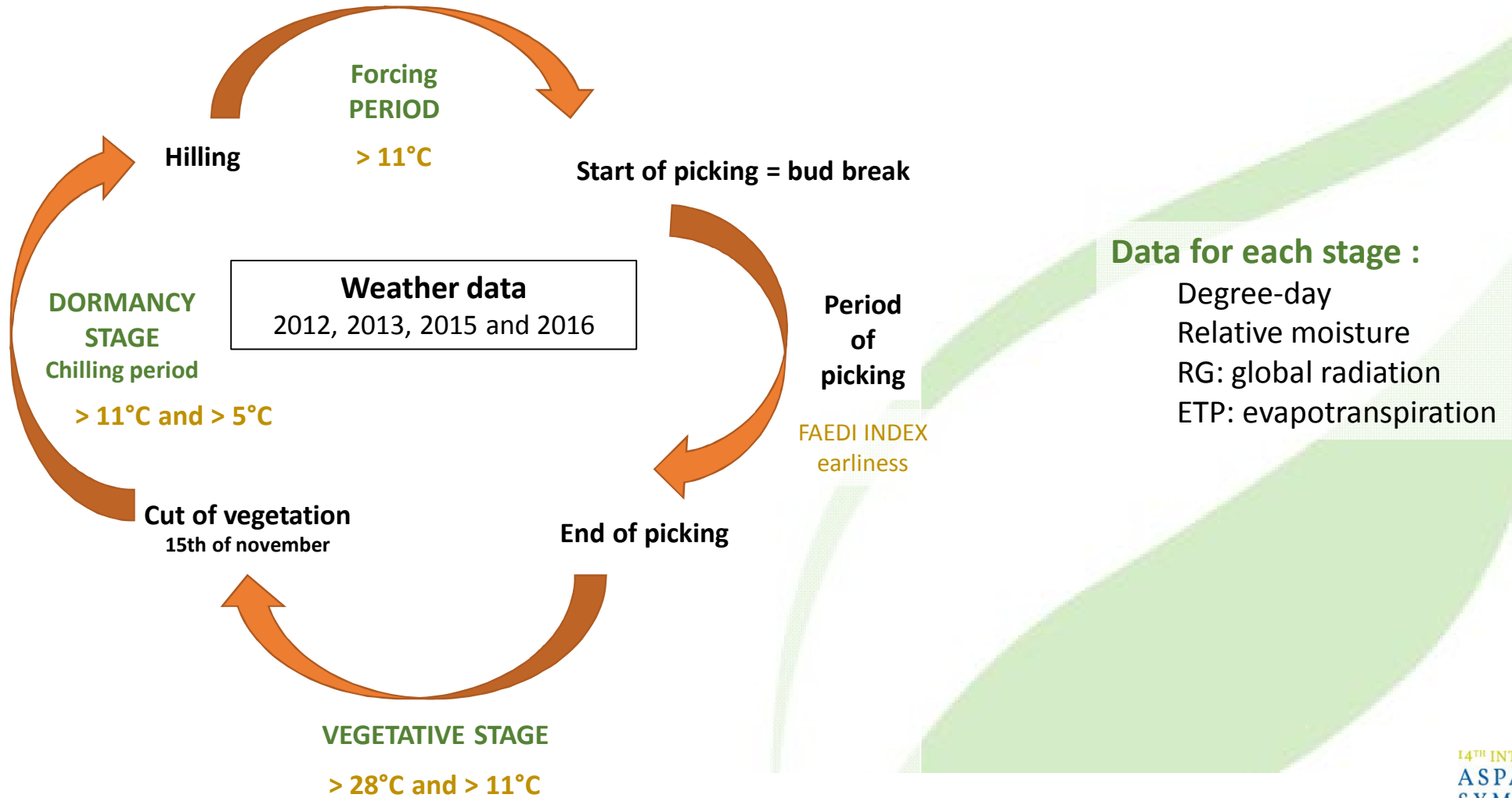
Asparagus trial

Randomized complete blockers – 3 replicates

2010 trial	2013 trial
30 crowns/ block	32 crowns/ block
19 230 crowns/ha	22 800 crowns/ha
21 F1-hybrids	24 F1-hybrids
9 supermale lines	



Weather data



Weather effect on hybrid earliness

Significant local variation of weather each year of picking ($p < 0,05$)

Spearman 's correlation

	Vegetative stage		Dormancy stage		Forcing stage	
	Degree -day 28°C	ETP veg	Degree -day 11°C	Global radiation	Relative moisture	Global radiation
Index Faedi	0,77	-0,57	0,35	0,19	0,69	-0,57
Yield	-0,32	0,54	-0,32	0,31	-0,47	0,54

Vegetative stage

→ Indirect effect on earliness (by direct effect on yield)

$p < 0,05$

Dormancy stage

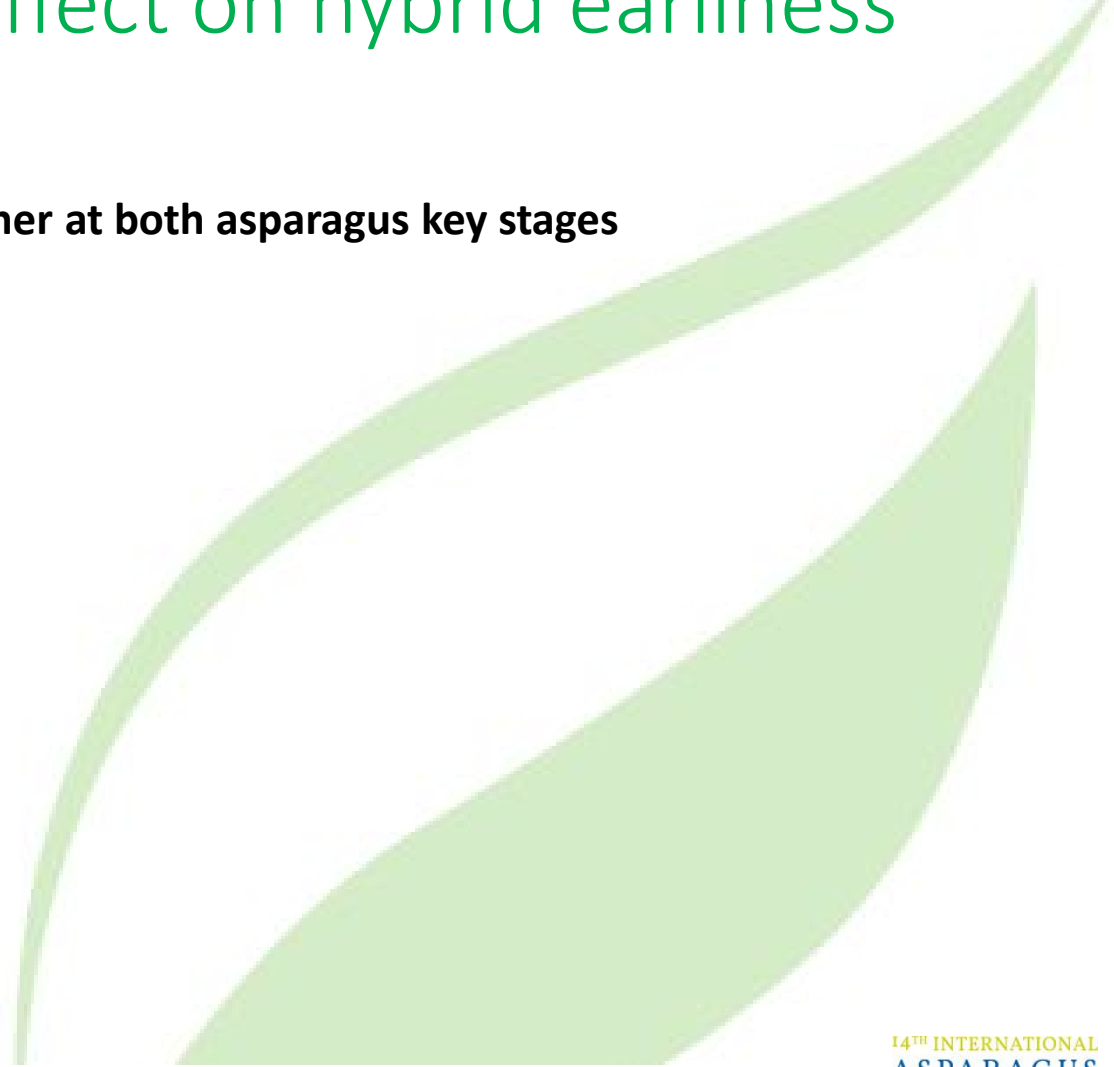
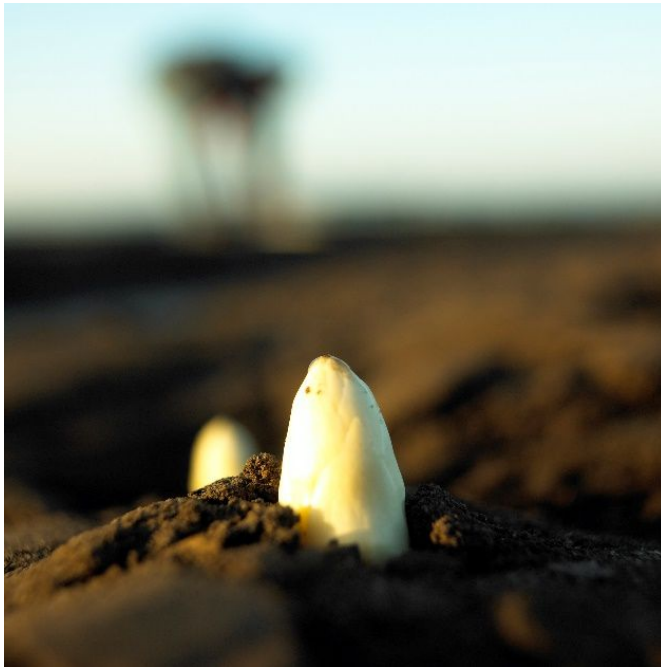
→ Annual weather variation might be too low to show an impact on earliness (multi-local trials more adapted)

Forcing stage

→ Forcing stage seems to be a key stage for earliness : early variety = fast answer to favorable forcing

Weather effect on hybrid earliness

Bud breaking = combinaison of the effects of weather at both asparagus key stages



Weather effect on hybrid earliness

Modalities of trials = weather and supermale

Analysis of variances	Sum Square	Degrees of freedom
Supermale	688.9	8**
Year of picking	865.6	3***
Supermale x year of picking	548.8	24
residuals	1450.5	52

** p<0.01 ***p<<0 (F-test)

→ Independance of the effects of the year (=weather) and supermale

Genetic a good way to improve asparagus earliness

Genetic progress: standard heterosis

Darlise : earliest variety

= **check variety**

$$\text{Standard heterosis (\%)} = \frac{F1 \text{ hybrid} - \text{Check variety}}{\text{Check variety}} \times 100$$

(Nuruzzaman et al., 2002)

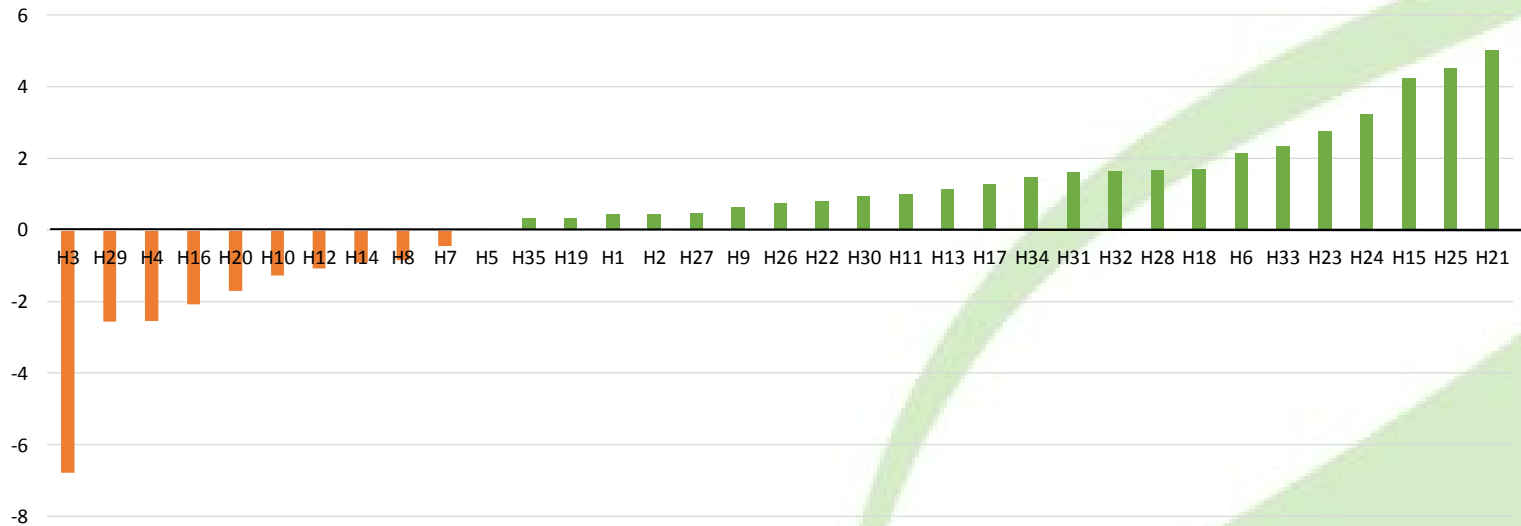


→ Negative Standard heterosis = F1 hybrid earlier than Darlise

Standard heterosis of earliness

Check variety = DARLISE

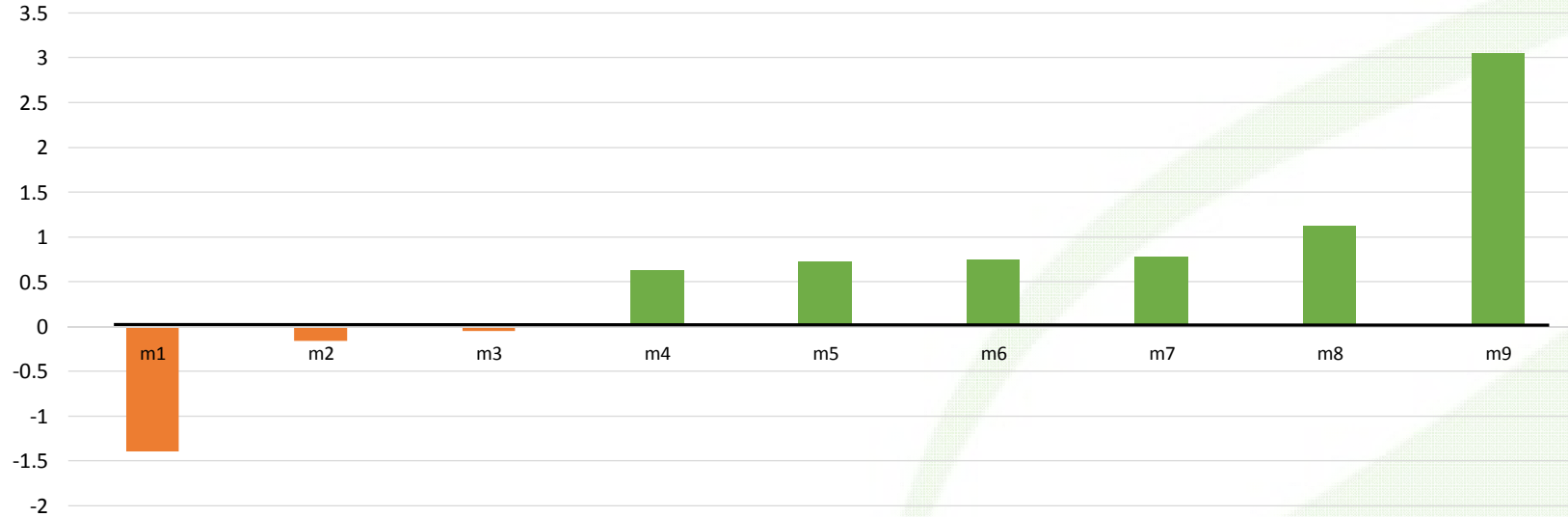
Standard heterosis of F1-hybrids



→ Our parental lines permit to improve earliness

Standard heterosis of earliness

Average of standard heterosis of supermale
check variety = DARLISE



→ Supermale line favorable to earliness
as others favorable to late production = large genetic pool

Conclusion

G x E interactions very important

Local trial permit to study the impact of E and G independently

FURTHER → breeding variety of agronomical interest (yield, quality, earliness, resistances)

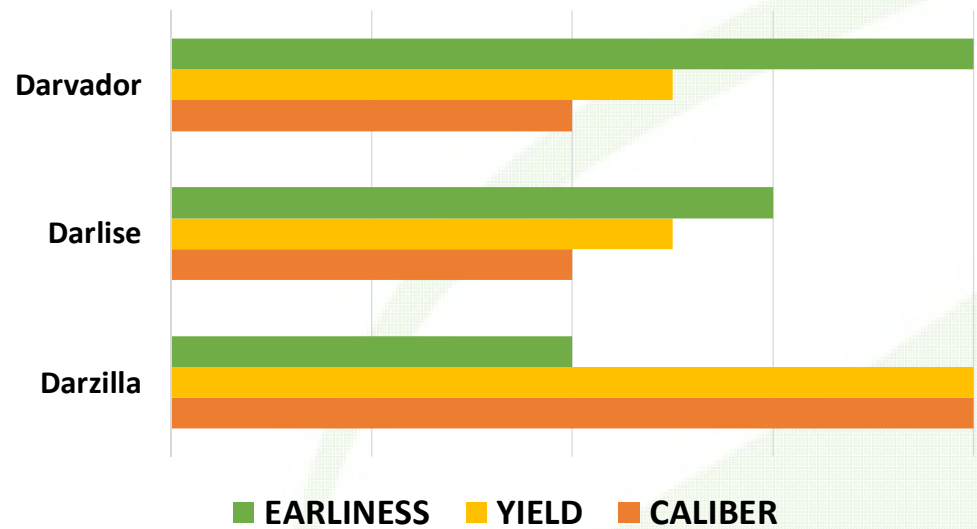
- evaluation of the combining abilities
- CLIMA x Genotypes interactions (multi local trials)

To breed variety of high performances and fitness

Darvador: New very early all male variety



A very early variety of high quality spears



→ And others varieties is coming soon !!

Thank you for your attention

