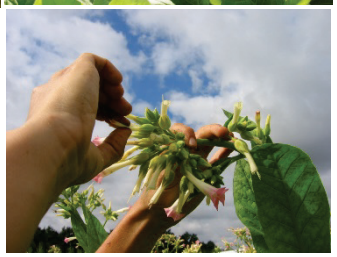
BERGERAC SEED & BREEDING




Genetic variability for upper stalk sucker growth in flue-cured tobacco

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CORESTA Meeting, Izmir, Turkey, AP27

CORESTA

Project and Origin

www.bergeracsb.com

To improve tobacco cultivars to meet the challenges of the leaf tobacco sector and the industry

- France, Europe, Africa and Asia…
- Decrease inputs and agrochemical uses → **this presentation**
- Contribute to the decrease of toxicants in tobacco products

Seed company set-up 2015 by France-Tabac USCA (French Tobacco Growers Cooperatives) from ITB tobacco breeding program & seed activity

- *Agreement in place with ITG*.

Upper stalk suckers

- Topping = removal of the inflorescence and upper part of the plant
  - Necessary to develop the raw matter quality
  - Increases yield
  - Stimulates development of axillary buds → upper stalk suckers
- Chemical control of upper stalk suckers necessary
  - Contact products, in particular fatty alcohols (FA)
  - Systemic products

Fatty alcohols (FA)

- Low risk profile
  - EPA 738-F-07-004, June 2007
- Residues close to tobacco constituants
  - G. Steffens, T. Tso, patent US3824094 A, 1974
  - “Many fatty acid esters and alcohols are found in tobacco leaves and seeds. Thus the application of fatty alcohols for tobacco sucker control will not result in the introduction of substances which are foreign to the composition of the tobacco”

Sucker control using fatty alcohols

- FA only efficient on young tissues
  - Suckers < 2 to 3 cm
    - Any sucker > 3 cm may grow!
    - Acts by permeating the cells cuticule
      - Dehydration and cell death
- Several applications needed
  - Contact product, does not penetrate tissues
- Usually needs to be combined
  - With a systemic or local systemic product

Using fatty alcolhols only?

- Critical: sucker size at the date of application
- Timing of application linked to crop floral growth
- Therefore, the critical trait studied here is
  - Suckers growth delay relative to floral growth
- Probably not the only one
  - For example, another trait of interest could be
    - Inflorescence well released from top leaves
      - Easier topping and more efficient sucker control product application

Similar floral growth stage…but different sucker size

Sucker

To be answered

- In flue-cured tobacco, how to assess delayed sucker growth relative to floral growth?
- Is the trait really related to a better efficiency of FA for sucker control?
- Is there some genetic variability for this trait?
- What about the links with other traits?
- Environmental effects on this trait?

In flue-cured tobacco, how to assess delayed sucker growth relative to floral growth?

Sucker to floral relative growth

- Floral growth season: 15 days
  - Differences fade out at late growth stages
  - Speed of assessment more important than accuracy
- To fulfil this need, we refined our approach from 2009 to 2014
  - Started with identifying shoots and coming back to them several times,
- Ended with
  - Scoring both sucker size and floral growth stages on many shoots.
  - Non identified.
    - Several reading dates, but not necessarily on the same shoots

Floral development

51-52

10

53-59

20

60

30

61

40

62-64

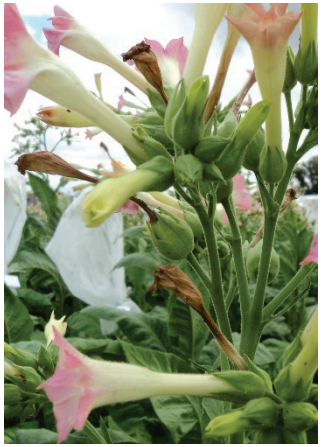
50

CORESTA growth stages

Scores for this study

71-80

70



65-70

60

Upper stalk suckers scoring

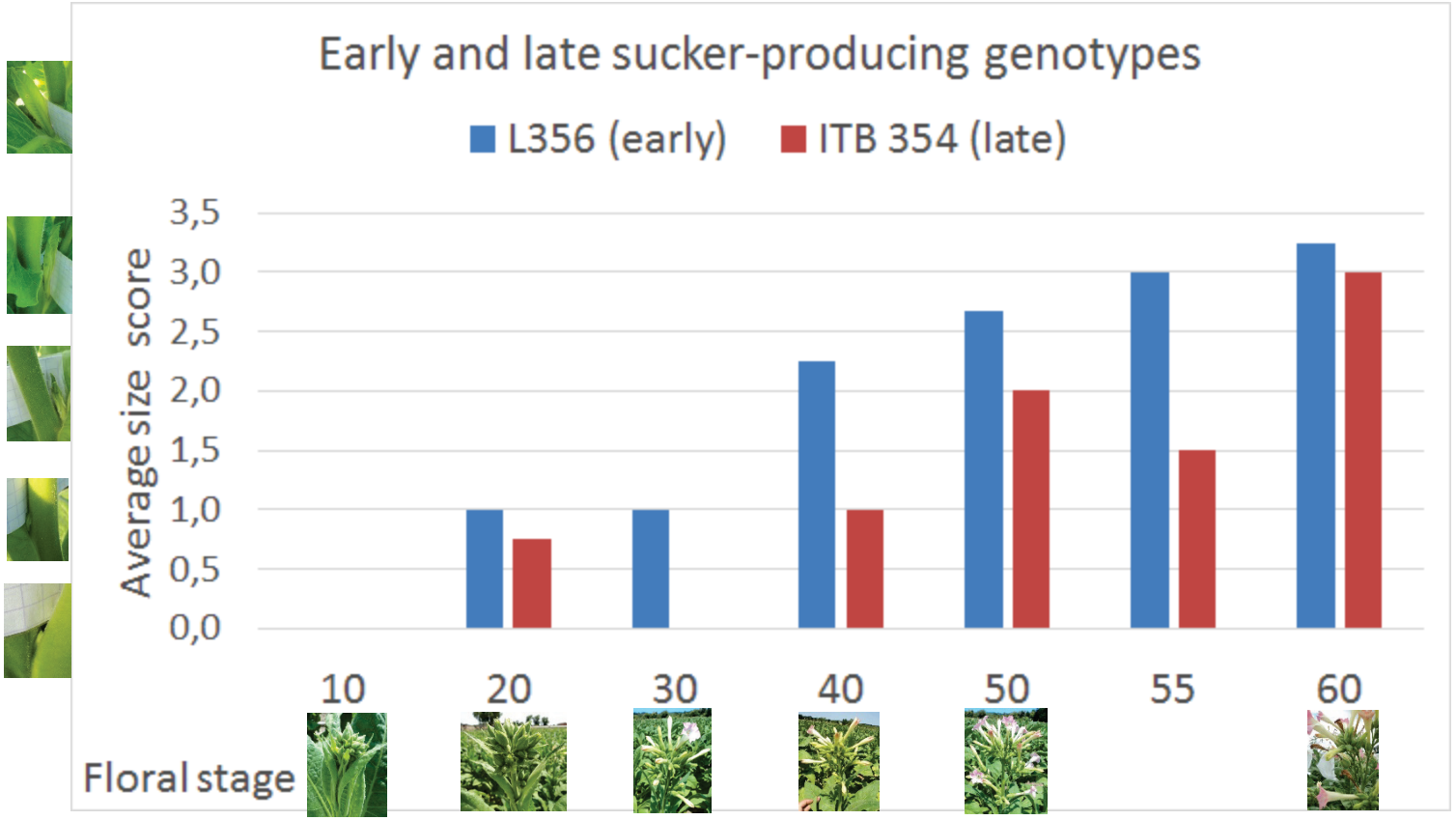
- Observed at or below the topping level :
  - Before topping: highest internode with leaf length > 20 cm
- Size of the biggest sucker
  - At this internode or below
  - According to scale

Sucker size scoring scale

0	1	2	3	4
< 5 mm	5-10 mm	>10 – 30 mm	>30 - 60	>60

Controlled by fatty alcohols | Out of control

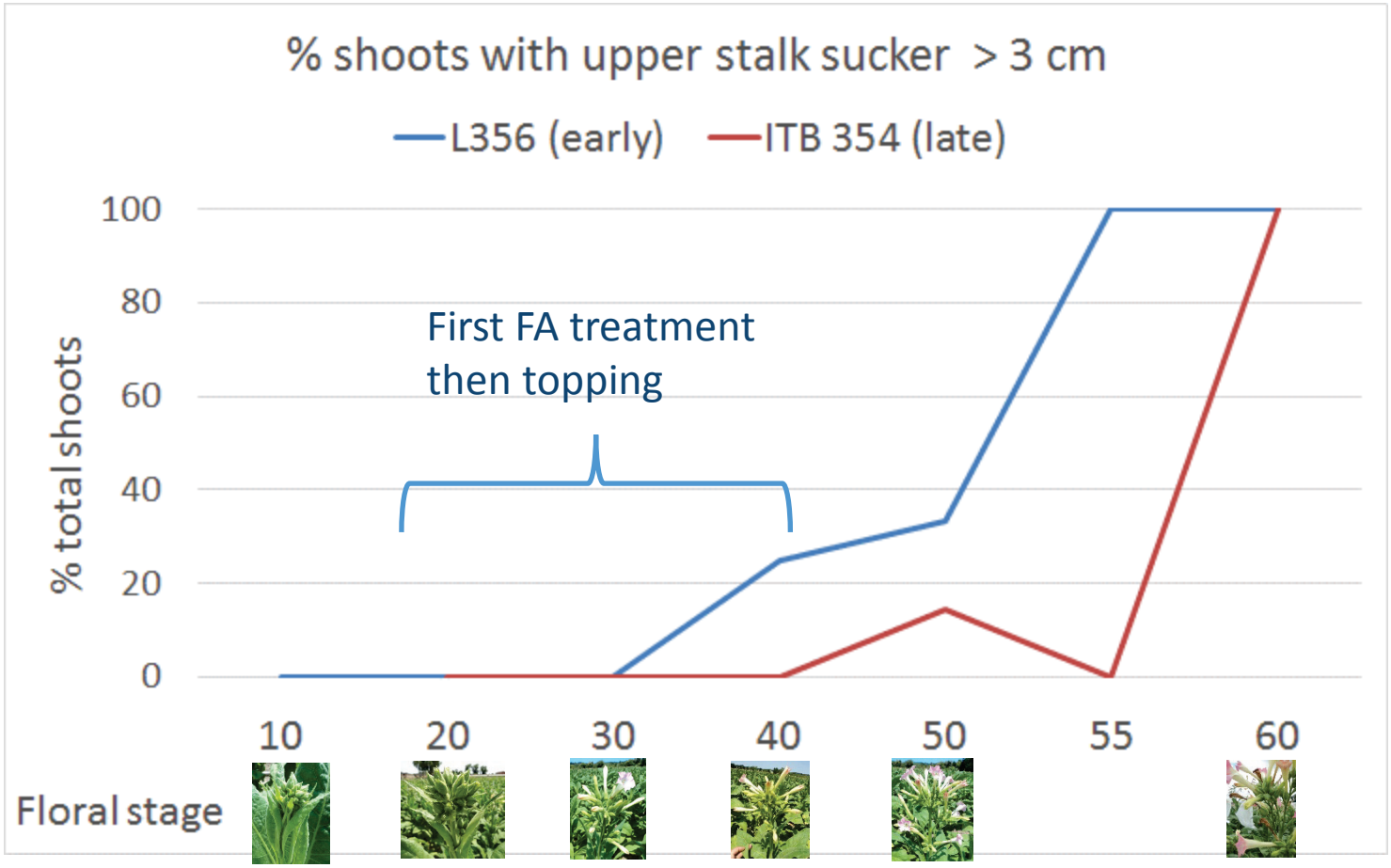
Sucker size versus floral stage



Quick observations from July 15 to 23 in the breeding nursery
total shoots observed 15 (L356) and 19 (ITB 354)
Bergerac 2015. Untreated, untopped.

Sucker size > 3cm / flowering stage

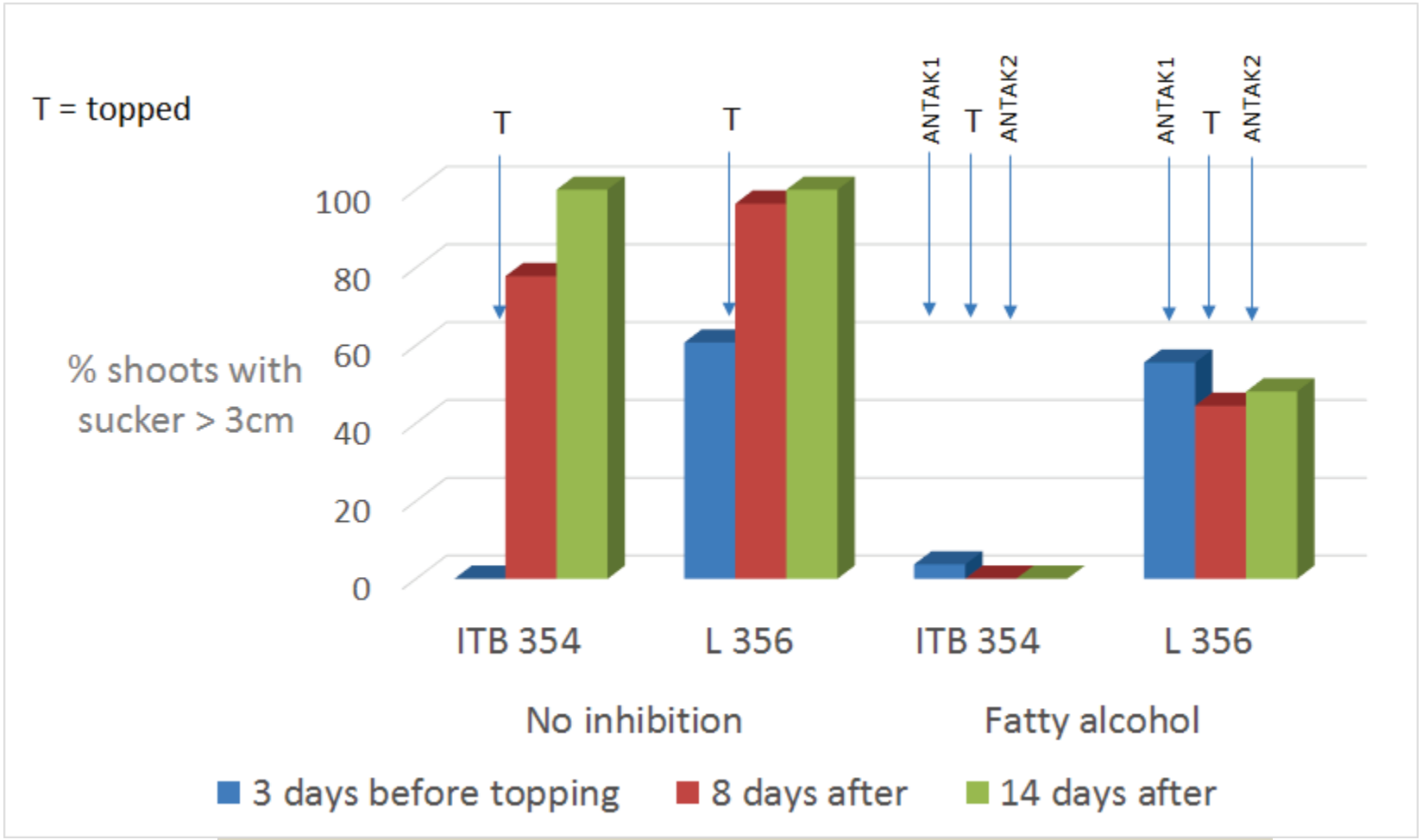
% Score > 2



2015, July 15 - 23. L356: 15 shoots, ITB 354: 19 shoots
Untreated, untopped.

Is the trait really related to a better efficiency of FA for sucker control?

FA efficient with late sucker cultivar



Field test Bergerac 2010	Back-pack sprayer	ANTAK 1	ANTAK 2
Individual plots : 14 shoots	Application date	3 days before topping	6 days after
2 reps.	Concentration	3%	4%
	Estimated quantity / plant (ml)	23	14

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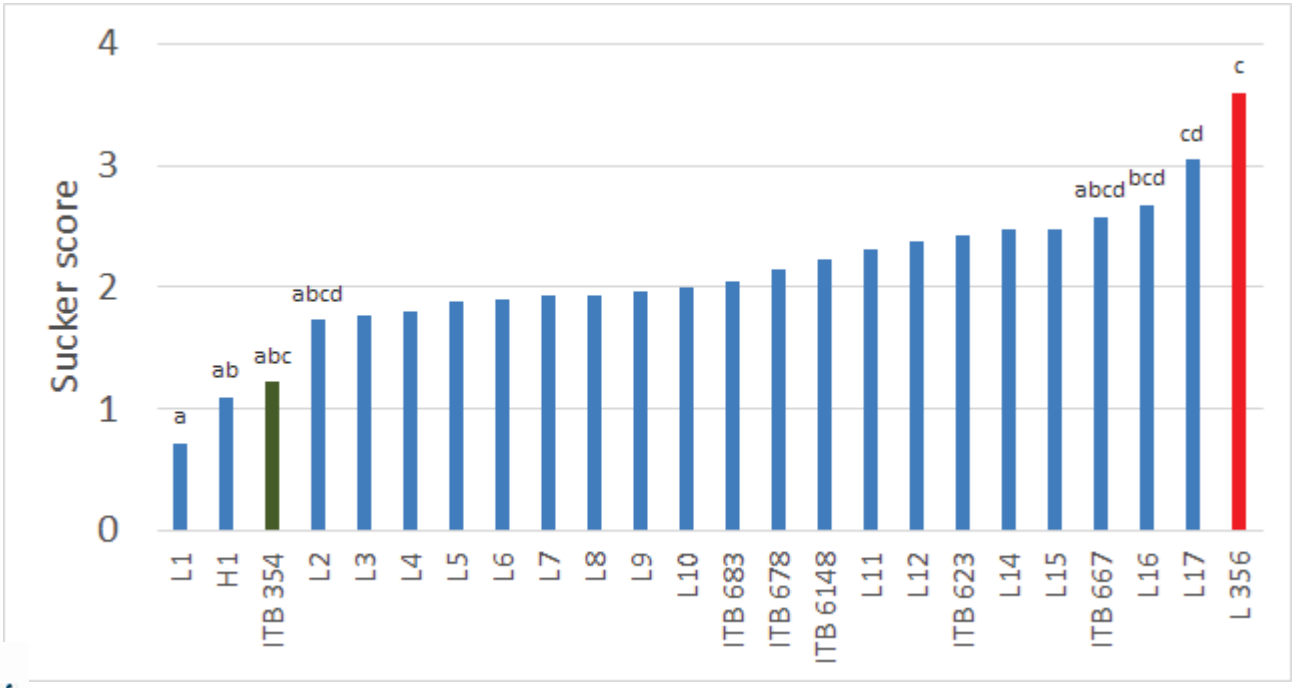
Is there some genetic variability for sucker growth delay relative to floral growth?

Field tests 2009 to 2013

- Aproach:
  - Assessing sucker size with a scale
    - At different floral growth stages
  - Collection of flue-cured genotypes,
    - List depending on years
  - 2-3 replicates of 10 – 20 shoots / genotype
- Results:
  - Highly significant differences among genotypes
    - In every of these tests
  - Set up a database grouping all results over the 5 years

Significant over 5 years

- 24 genotypes replicated several years
  - Sucker score = constant + genotype + year + residual
  - P(F genotype) = 0.004



Links with other traits?

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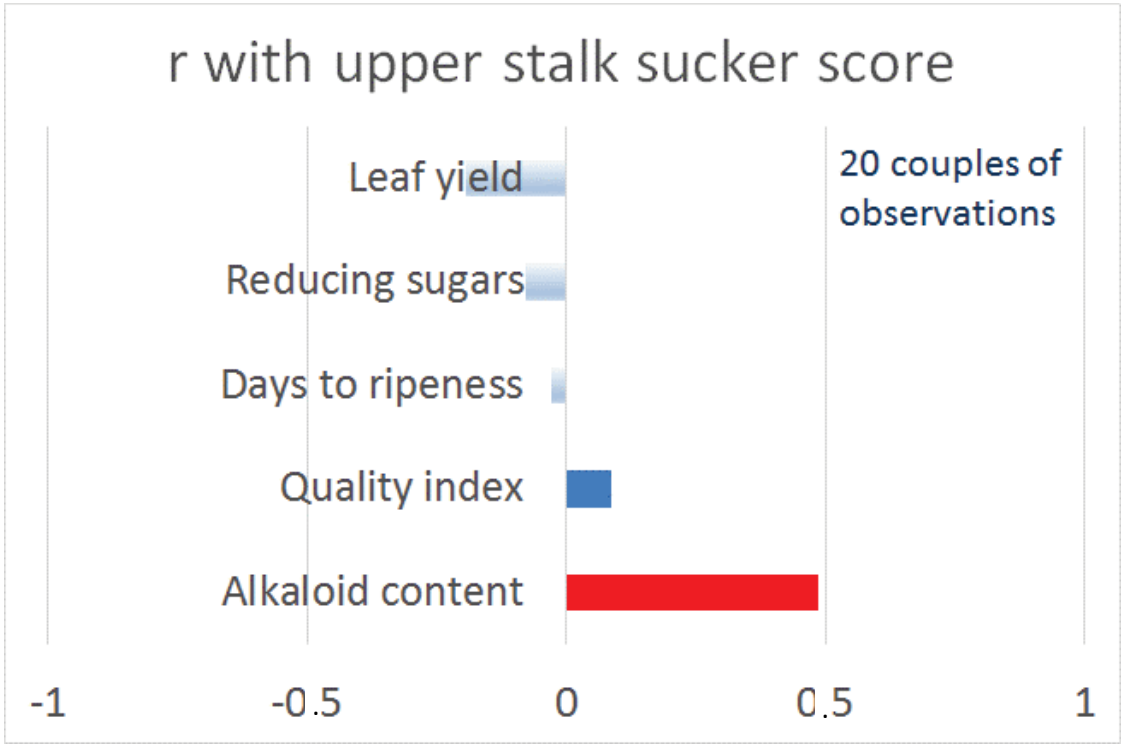
- Possible link with alkaloid content
  - to be assessed with more data
- To be explored:
  - Stem ratio
  - Leaf spacing
  - Leaf number
  - Ground suckers



Significant level for r (5%) = 0.44

Environemental effects on sucker growth relative to floral growth?

Environemental effects

- Many
- Non exhaustive list:
  - Temperature
  - Plant population
  - CMV infection
  - Stalk bent (wind)

CMV infection

- Narrower leaf shape
- Increased sucker growth & number
- Dramatic effect

Shoots bent due to wind

- Quick growth of axillary buds
  - Mainly on one side of stalk
  - Hours following wind
- Very sensitive system
  - Even when shoots slightly bent
- Importance of « standup » ability to facilitate sucker control

Conclusions

- Genetic variability for delayed upper stalk sucker growth, relative to floral growth, exists in flue-cured tobacco,
- Delayed sucker growth relative to floral growth helps controlling suckers with contact products
- Trait difficult to assess due to short period of time
- Possible links with plant shape and alkaloid content

Perspectives

- Efforts to improve cultivars underway
- Agronomic tests using improved cultivars will be necessary
  - In other locations and production schemes than France, Bergerac
  - We wish collaborations with final users!

Thank you for your attention!

Jean-Louis

Julie

Acknowledgement

We thank Imperial Tobaccco, for kind permission to use and present the 2009-2014 data from the former Bergerac Tobacco Institute