CERCOSPORA LEAF SPOT IN ITALY:

NEWS ABOUT APPLIED STRATEGIES IN ORDER TO OVERCOME THE RESISTANCES

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CONTENT

This presentation talk about…

- Foliar diseases of sugar beet
  - spread
  - CLS economic incidence

- CLS management
  - application timing (predictive model)
  - Decision Support Sistem
  - News on fungicide recommendations in order to overcome resistance

FUNGAL FOLIAR DISEASES

IN ITALY

SPREAD AND ECONOMIC INCIDENCE

Fungal disease	Spread (%)	Economic incidence	note
Cercospora beticola	100		severe in the Po Valley and north-east
Erysiphe betae	40		mainly in the Po right side and near to the seaboard
Alternaria tenuis	0.5		only in spots
Phoma betae	0.5		only in spots

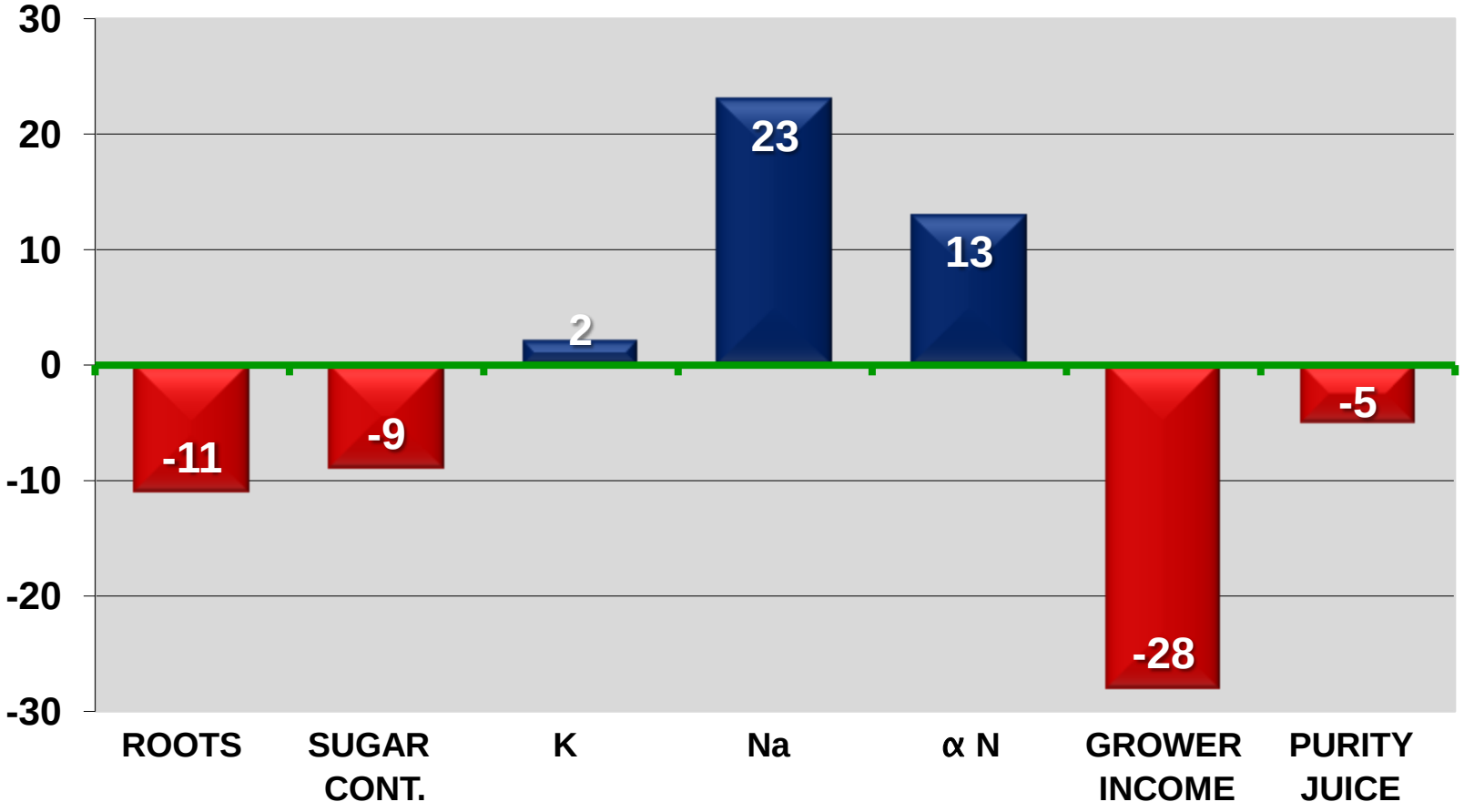
HIGH LOW NULL

CERCOSPORA LEAF SPOT:

ECONOMIC LOSSES

CLS: HOW YIELDS ARE INFLUENCED

PERCENTAGE VARIATION



DISTRIBUTION AND SEVERITY OF CLS IN NORTH ITALY

CERCOSPORA MANAGEMENT: THE APPLICATION TIMING

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focus on the monitoring systems

(*Annex III – IPM general principles):*

- point 2: «**Harmful organisms must be monitored** by adequate methods and tools... Such adequate tools should include observations in the field as well as scientifically sound warning, **forecasting** and **early diagnosis systems**...».

- point 3: «Based on the **results of the monitoring** the professional user has to decide **whether** and **when** to apply plant protection measures... For harmful organisms **threshold levels defined** for **the region**, **specific areas**, crops and particular climatic conditions **must be taken into account before treatments**...».

CLS INFECTION PREDICTION MODEL

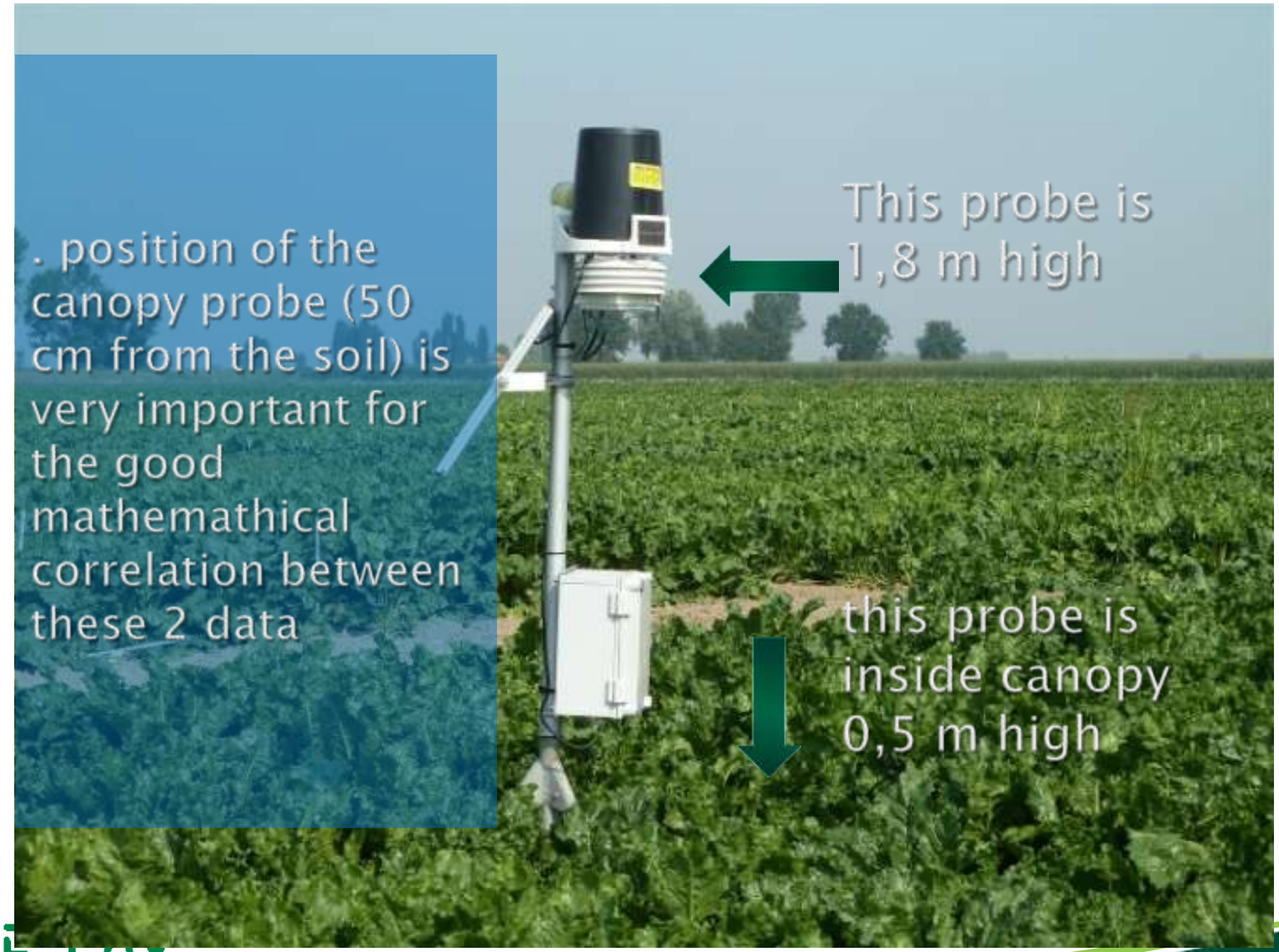
Developed by NDSU University
was adapted to Italian conditions from 2009

- The model is designed **to predict** when infection of sugar beet by *Cercospora beticola* **is likely to occur**

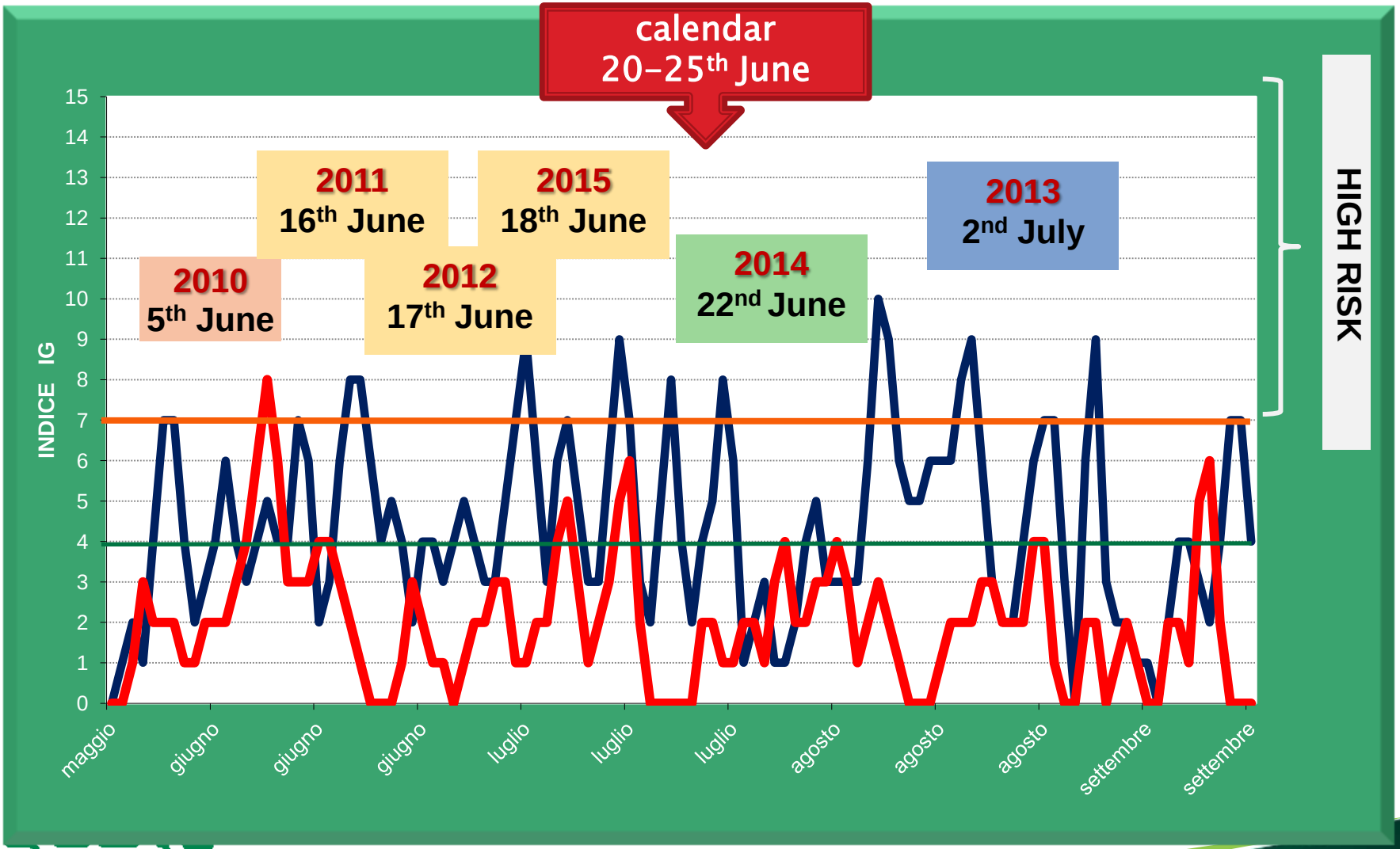
- Based on **hourly temperature** and **relative humidity** information

- Fungicide application is recommended when **weather conditions are favourable** for **disease infection**

METEO STATION AND PROBES POSITION



FIRST TREATMENTS BASED ON PREDICTIVE MODEL <MINERBIO SB AREA – LAST 5 YEARS>



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MANAGING CLS TREATMENTS: DECISION SUPPORT SYSTEM (DSS) FOR FARMERS

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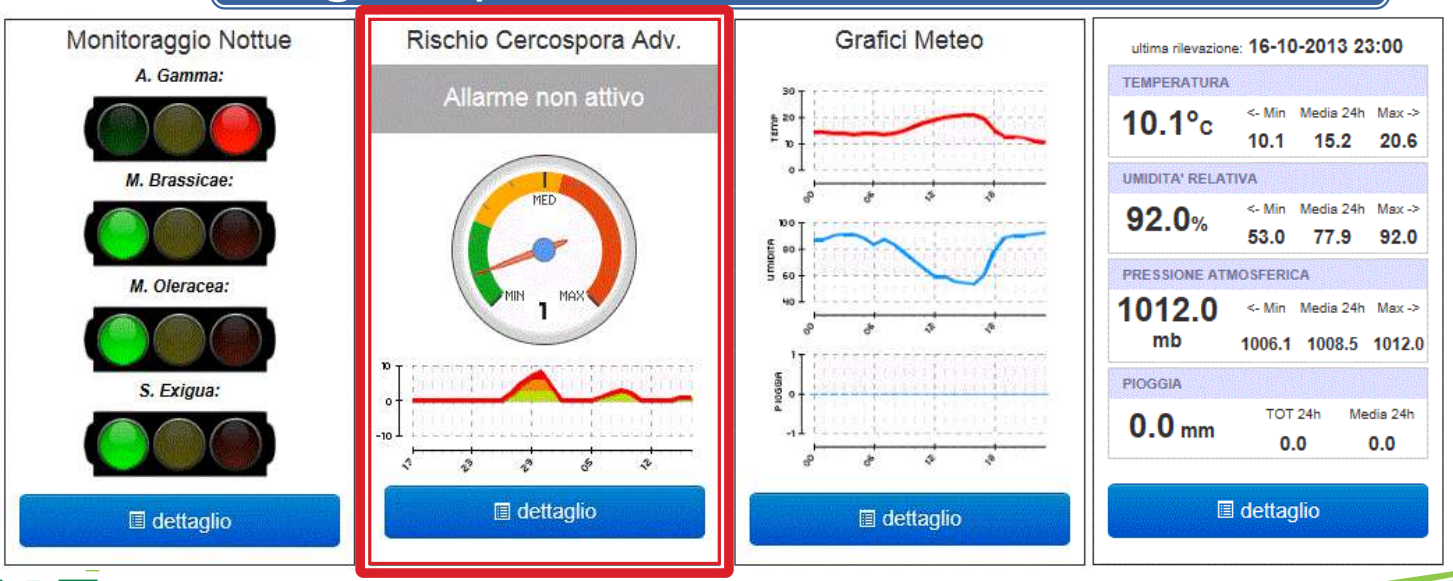
DSS: USERS AND DEVICES

Technicians/Growers

Computer, tablet, mobile

On line dashboard:
widget style



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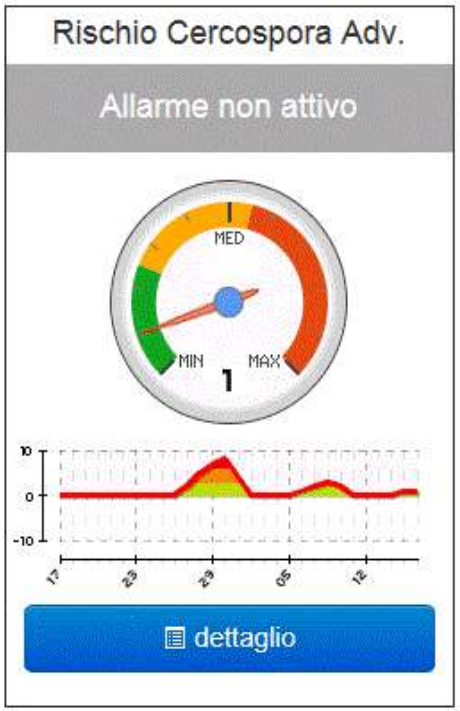
DSS: CLS PROCESSING

METEO STATIONS IN THE SUGAR BEET AREA

- **INPUT**: none
- **DB**: weather data net
- **ALGORITHM**: Beta Cercospora Previsional Model
- **OUTPUT**: risk level

Cercospora leaf spot control

Output for growers



CLS FUNGICIDES:

SITUATION IN ITALY

AVAILABLE A.I. FOR THE CONTROL OF CLS IN ITALY (*FRAC group*)

DMIs	Dithiocarbamates	QoIs	Others
triazoles (G1) *tetraconazole, difenoconazole, propiconazole, bitertanole* imidazoles (G1) *prochloraz*	mancozeb* (M3)	azoxystrobin (C3)	copper compounds (M1)
		trifloxystrobin (C3)	chlorothalonil (M5)
		pyraclostrobin (C3)	fenpropidin (G2)
			thiophanate-methyl* (B1)

**= not registered yet; Health Ministry licensed for 120 days application (2015 CLS control emergency)*

FUNGICIDES DURING THE LAST FIVE YEARS…

- The difficulty to CLS control observed during 2010 imposed to monitoring biological activity of **all fungicides registered** (and **some not**) on sugar beet
- After a couple of years was clearly indicated that **QoIs resistance had developed** in some *Cercospora beticola* populations (laboratory tests confirmed field trials)
- As for **DMI's** (i.e. difenoconazole) some cases of **decreased sensitivity of the pathogen** were observed
- Which is now in Italy **the best strategy** for CLS control?

CLS FUNGICIDE EFFICACY 2015 (L=LOW; M=MEDIUM; H=HIGH)

Active ingredient	A.I. (%)	dose (l/ha)	efficacy
thiophanate-methyl *	41.7	1.5	H
chlorothalonil	500.0	2.0	MH
copper oxychloride + hydroxide	various	3.5	MH
mancozeb *	75.0	2.1	M
flutriafol + prochloraz	4.10 + 15.74	2.0	ML
fenpropidin + difenoconazole	38 +10	0.7	ML
cyproconazole + prochloraz	16.15 + 2.15	2.6	ML
prochloraz + propiconazole	34.8 + 7.8	1.5	ML
propiconazole	25.25	1.0	L
prochloraz	39.8	1.0	L
tetraconazole	3.85	2.5	L
fenbuconazole	5.0	2.0	L
bitertanol	44.7	1.0	L
difenoconazole	23.9	0.3	L
azoxystrobin + cyproconazole	18.2 + 7.3	1.0	L
piraclostrobyn + epossiconazole	12.5 + 4.7	1.0	L
trifloxystrobin + ciproconazole	74.4 + 14.6	0.4	L
sulfur micronized	various	7.0	N

**= not registered yet; Health Ministry licensed for 120 days application (2015 CLS control emergency)*

NEW STRATEGIES FOR CLS CONTROL

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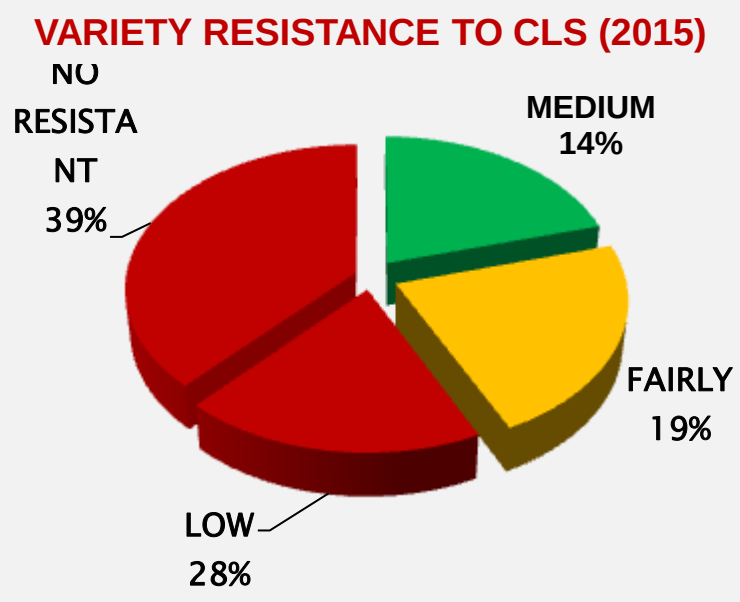
WHAT IT IS IMPORTANT TO KNOW

Varieties: genetics doesn't offers sufficient levels of resistance yet

Fungicides: play the most important role to contain the pathogen

Timing: utilize a treatment decisional support tool based on CLS epidemiological oriented thresholds



THE BEST STRATEGY? A COMBINATION BETWEEN HIGH-PERFORMING VARIETIES RESISTANT TO CLS, THE BEST FUNGIDES AVAILABLE, CORRECT TIMING OF TREATMENTS

WHICH FUNGICIDES CHOOSE AND HOW TO USE THEM?

SOME IMPORTANT ADVICES

1. **Choose fungicide on the base of**
   a. the efficacy showed in the field trials
   b. the phase of the disease cycle

2. **Comply with the FRAC recommendations** (*Fungicide Resistance Action Committee*) for limiting the risk of resistance onset

ANTI-RESISTANCE RULES

DIRECTIVE "SUSTAINABLE USE" OF PESTICIDES 2009/128/EC

focus on the resistance prevention

(*Annex III – IPM general principles):*

- point 6: it is hoped the reduction of the chemical input, as long as *«…it **doesn't increase the risk to develop resistance** mechanisms …»*

- point 7: *«where the risk of resistance is known …the available anti-resistance strategies **should be adopted to maintain the fungicides efficacy.** This could include the use of different fungicides with different mode of action»*

HOW TO MANAGE THE RISK OF RESISTANCE OF FUNGICIDES?

FRAC rules (Fungicide Resistance Action Committee)

- Apply the fungicide as a mixture with **more a.i. of different type**, or as one component in a **rotation or alternation** with **different mode of action**
- **Avoid eradicant use**
- Maintain **manufacturers' recommended dose**
- Adopt the **integrated disease management** (IPM)
- Distribute the **fungicide properly** and **evenly on the leaves**, in order to avoid exposure of populations at low doses
- Maintaining a **chemical diversity**

THE FUNGICIDES ON THE BASIS OF RESISTANCE RISK (*source:* FRAC)

Resistance risk	Fungicides	Chemical group
LOW	chlorothalonil mancozeb copper compounds	phenolic compounds dithiocarbamates copper compounds
MODERATE	bitertanole, cyproconazole, difenoconazole, flutriafol, propiconazole, tetraconazole	DMIs (triazoles)
	prochloraz	imidazoles
	fenpropidin	piperidines
HIGH	azoxystrobin, trifloxystrobin, pyraclostrobin	Qols (strobilurins)
	thiophanate-methyl	thiophanates

FUNGICIDE RECOMMENDATIONS

GUIDELINES FOR THE BEST CLS CONTROL

In all treatments use a multi site action fungicide

T1. full dose of **chlorothalonil + sulphur** (powdery mildew activity)

T2. **chlorothalonil + thiofanate-methyl** (max. threshold 4% of ALA)

T3. **copper salts** (mix of oxychloride + hydroxide) + **tank mix DMI's** (no a.i. alone)

NEW STRATEGIES – ITALY (2015)

Timing	Multi-site +	First choice *or*	Second choice
T1	chlorothalonil	sulfur compounds	.prochloraz+triazole . difenoconazole + fenpropidin
T2		thiophanate-methyl	--
T3	copper compounds or mancozeb	. prochloraz+triazole . difenoconazole+fenpropidin	--
T4			--

NB: *strobilurins are used only for powdery mildew control*

basis fungicide

fungicide to be added

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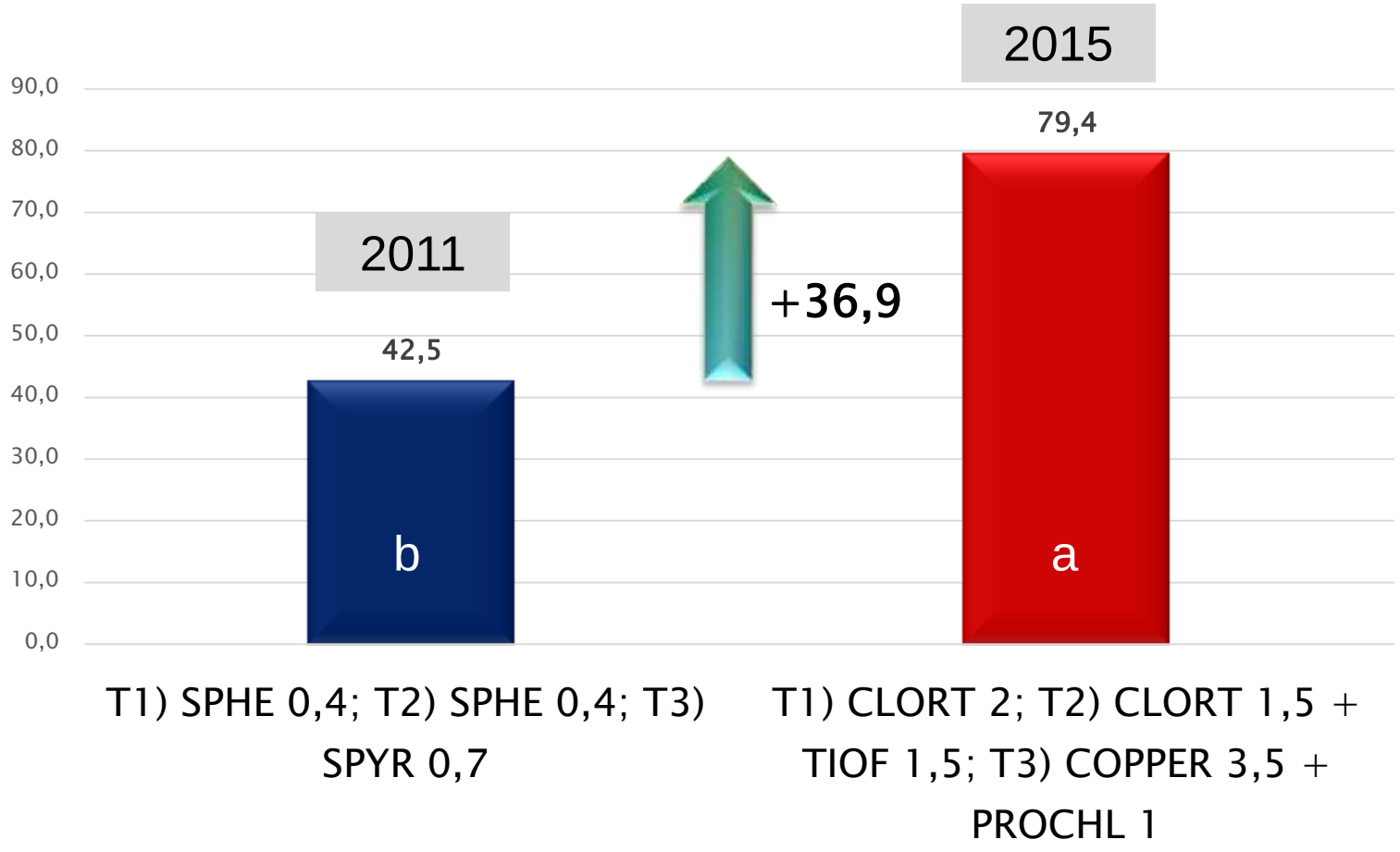
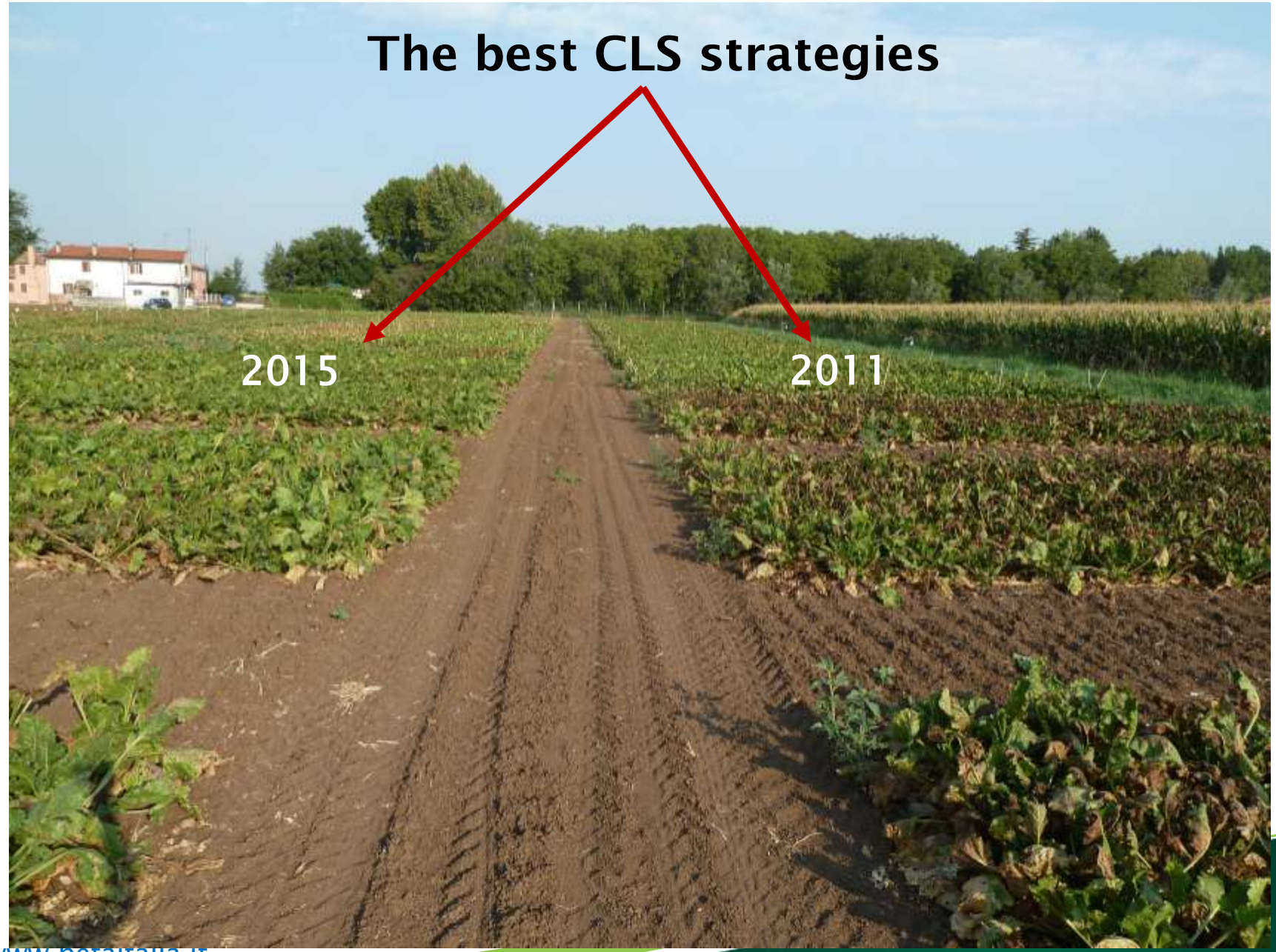
The best 2011 and 2015 CLS strategy

Efficacy level: Affected Leaf Area (%)



Field trials: *14th of August 2015*



CONCLUSIONS

- the occurrence of **resistant strains** of CLS to **strobilurins** and decreased sensitivity for **difenoconazole, tetraconazole** were monitored in Italy

- for the best CLS **strategies** is very important use **fungicides: multi-site inhibitors** (chlorothalonil, copper comp., mancozeb), **benzimidazoles** (thiophanate-methyl) in T2, **DMI's** tank mix

- **timing of treatments** based on agrometeorological-**forecasting model**

THANK YOU FOR YOUR ATTENTION

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