

**PROTECTION AGAINST APPLE SCAB (*Venturia inaequalis*)
A REPORT ON SEVERAL YEARS WORK**

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INTRODUCTION

Apple and pear scab is a disease which is difficult to control in organic fruit production : management by cultivation procedures is insufficient and usable products are only preventative. Their use requires great professional skill.

Since 1988, G.R.A.B. has been investigating solutions to improve scab control :

- * Optimisation of the use of plant care products : Copper and Sulphur : increase in their efficiency and reduction in their disadvantages (phytotoxicity, russet)
- * Investigation to find alternatives.

COPPER

Copper is the most efficient natural fungicide for scab protection. One of its great drawbacks is its phytotoxicity, russet in particular.

We tried to reduce it by using formulations containing a lower quantity of copper.

With this as an aim, we tested CUIVROL (18 % Cu SO₄).

Preliminary field trials in 1989 gave good results. They were confirmed by an other trial in 1990 : Cuivrol (2 kg/ha) was as efficient as Captane ([see 1a et 1b](#)). But, the russet effect, even with a low dosis of copper wasn't avoided ([see 1c](#)).

In 1992, we tried to reduce it by the addition of a calcium spray (COSYNOL SC, 27 % CaO; used as foliar complement).

The efficiency against apple scab was good but the addition of calcium only limited the russet a little, not enough to make a significant difference ([see 2](#)).

Conclusion :

The use of copper enables good protection but its use must be reserved for before blooming when the temperature is too low for the use of sulphur (f.i for the first spray at the stage "bursting of buds").

SULPHUR

Except on some varieties and when temperature is high, wettable sulphur is tolerated better than copper. But, its efficiency depends greatly on temperature, its duration is shorter, so its supply has to be renewed more often.

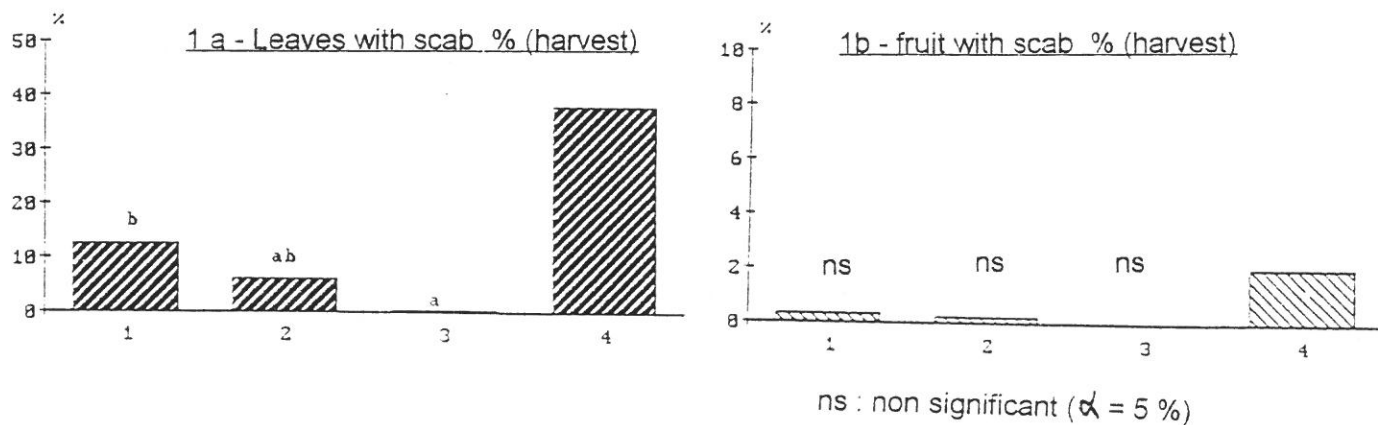
In a first period trials, we tested sprays of wettable sulphur with bentonite or stone dust (SILKABEN).

1 - TEST OF CUIVROL AND SILKABEN + W. SULPHUR - 1990
(SRPV Midi-Pyrénées)

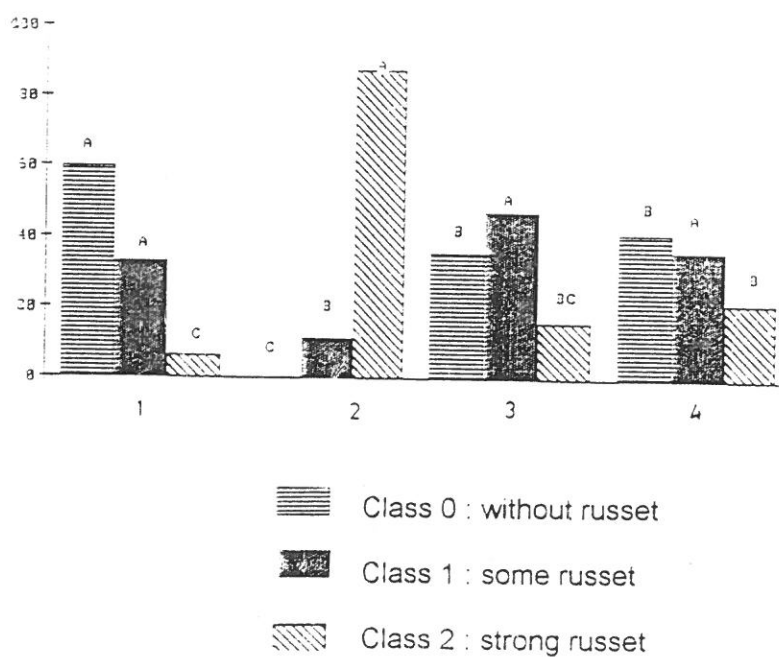
8 sprays from C3 stage to June - cv Golden - 15 scab infections

	PRODUCT (P)	ACTIVE INGREDIENT (AI)	DOSIS P/ha (1000 l/ha)	DOSIS AI/ha (1000 l/ha)
1	Silkaben + Thiovit	Stone dust + w. sulphur 80 %	1 kg + 5 kg	1 kg + 4 kg
2	Cuivrol	Cu SO ₄ 18 %	2 kg	0,36 kg
3	Phytocape 83	Captane	1,8 kg	
4	Witness			

Results :



1c - % fruit with russet/class



2 - TEST OF CUIVROL + CALCIUM - 1992

7 sprays from C3 stage to June : cv Golden - 5 scab infections

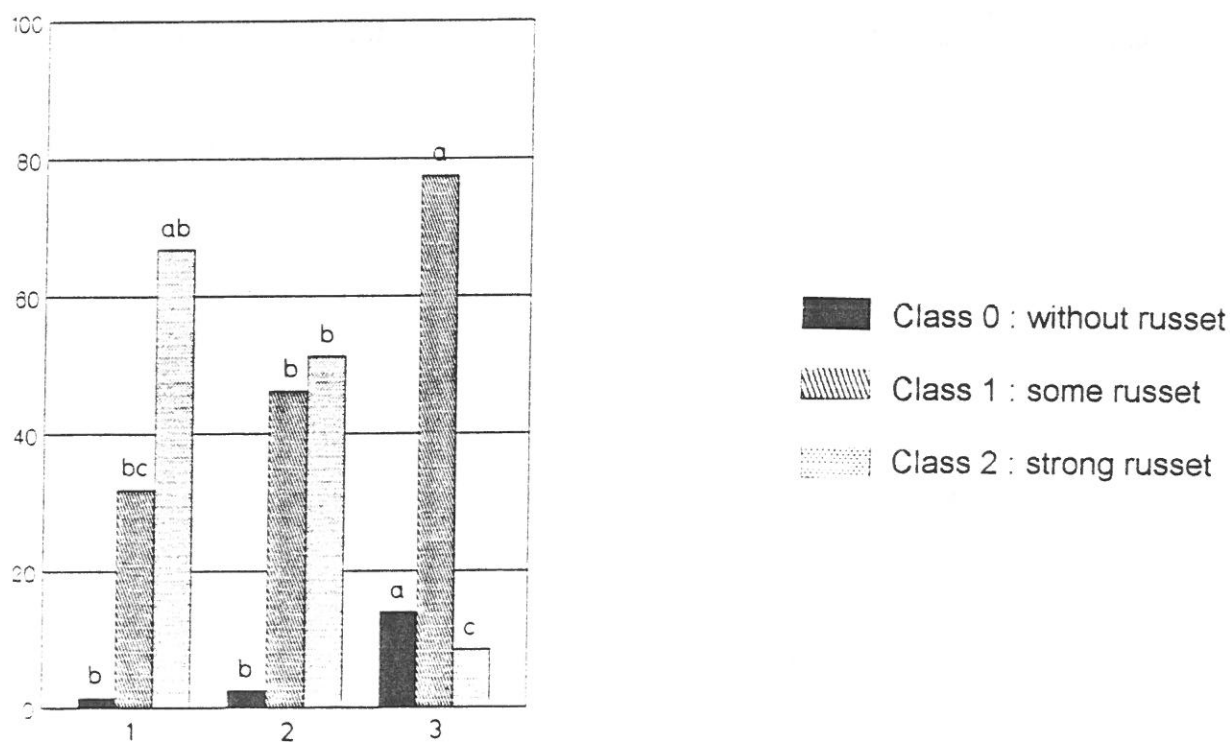
	PRODUCT (P)	ACTIVE INGREDIENT (AI)	DOSIS P/ha (1000 l/ha)	DOSIS AI/ha (1000 l/ha)
1	Cuivrol	Cu SO ₄ 18 %	2 kg	0,36 kg
2	Cuivrol + Cosynol sc	Cu SO ₄ 18 % + CaO 27 %	2 kg + 4 kg	0,36 kg + 1,08 kg
3	Witness			

Results :

scab : - no significant difference between modalities on leaves
- 0 % of fruit with scab at harvest

russet :

% fruit with russet/class



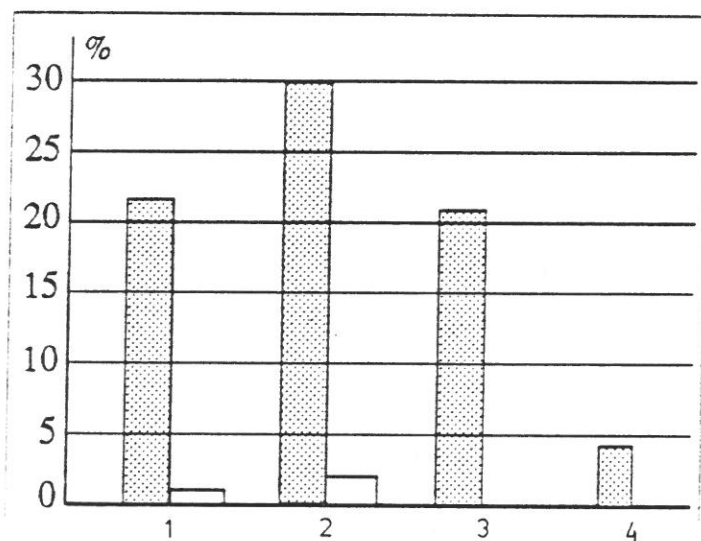
3- TEST OF DIFFERENTS PROGRAMS WITH SULPHUR - 1992

8 sprays from C3 stage to June - cv Golden - 8 scab infections

	PRODUCT (P)	ACTIVE INGREDIENT (AI)		DOSIS P/ha (1000 l/ha)	DOSIS AI/ha (1000 l/ha)
1	Heliosoufre	w. sulphur 70 % + pine oil 11,7 %		6 l	4,2 kg
2	Thiovit + Silkaben	w. sulphur 80 % + stone dust		10 kg + 10 kg	8 kg
3	Thiovit	w. sulphur 80 %		10 kg	8 kg
4		Captane		1,8 kg	

Results :

Leaves and fruit with scab % (harvest)



■ Leaves with scab

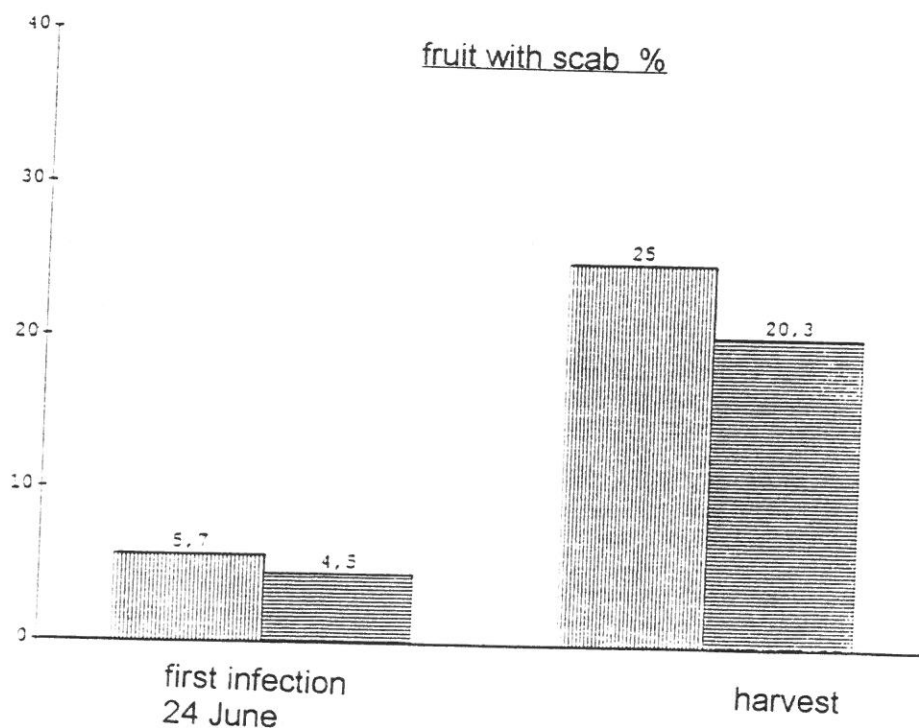
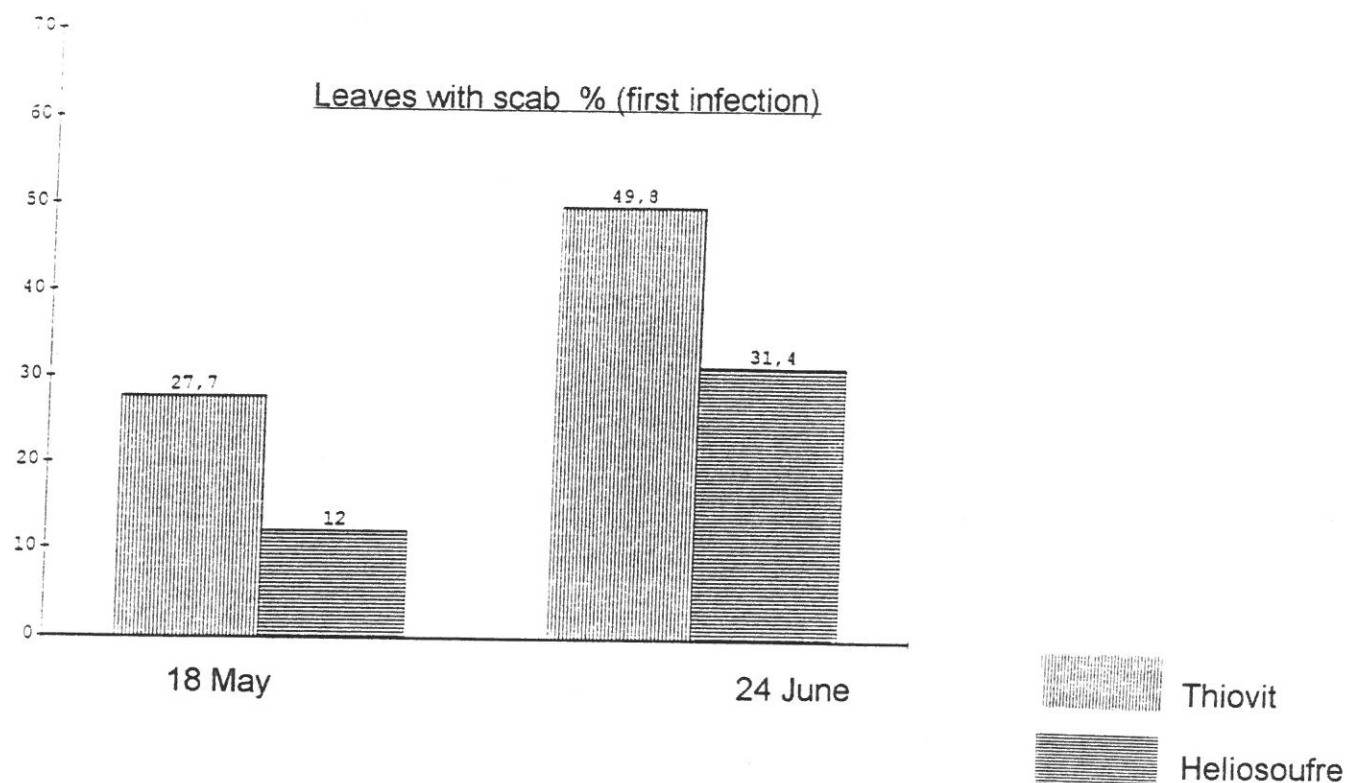
□ fruit with scab

4- TEST OF SULPHUR + PINE OIL - 1993

10 sprays from C3 stage to June - cv Golden - 15 scab infections

	PRODUCT (P)	ACTIVE INGREDIENT (AI)	DOSIS P/ha (1000 l/ha)	DOSIS AI/ha (1000 l/ha)
1	Heliosoufre	w. sulphur + pine oil	7 to 5 kg/ha	4,9 to 3,5 kg/ha
2	Thiovit	w. sulphur	15 to 7 kg/ha	12 to 5,6 kg/ha

Results :



The addition of bentonite is gradually abandoned by growers because of its difficulty to use (corrosive effect) and drawback effect (fruit coloration).

The mixture w. sulphur + Silkaben seemed to be quite efficient ([see 1a](#)) but, later field trials have shown that its efficiency was not better than that obtained in the trial when sulphur was used alone ([see 3](#)).

Now, SILKABEN used less and less because of its price and disadvantages like with bentonite.

Its efficiency against storage diseases needs to be investigated.

We have tested sprays of w. sulphur alone with success ([see 3 and 4](#)) and with the addition of a strengthening agent, pine oil. This mixture is commercialised, under the name of HELIOSOUFRE. Its advantage is that it permits a reduction in the dosage of sulphur to half but is as equally efficient : [see](#) filed trials 1992 results, [3](#) and 1993, [4](#).

It seems that the addition of pine oil enables a better protection when scab infection conditions are very severe as in 1993 in the South of France : a lot of rainfalls for several days : eluviation and difficulty in renewing the spray.

Conclusion :

Sulphur enables a good protection but needs a great professional skill in its application to obtain good results.

Addition of wetting agent seems to facilitate its use and would permit a reduction in the quantity of sulphur applied.

PROSPECTS :

At this stage of our work, taking into account several years of field trials and the observations made in organic in South France, it is important to consider the following three points :

1 - To improve not only the efficiency of the available products but also their application.

This observation is supported in particular by the results observed in six orchards in the same area, this year where the weather was very propitious to scab infection : there is a great variability in the results, not only due to the products but also to their application and to the grower's experience.

2 - To investigate alternative plant care products. But, for professional fruit growing, their ability to be applied on large surfaces must be taken in consideration (compost extracts, plants teas,...).

3 - To test new apple scab resistant varieties in the conditions of organic growing. In France, four varieties are as yet commercialized (PRIAM, FLORINA, JUDELIN, BEAUJADE), but about ten new ones are under experimentation. There are varieties which are resistant to apple scab but also resistant or less susceptible to mildew, fire blight and rosy apple aphid. So their availability is greatly expected by organic fruit growers and their suitability for organic growing must be critically examined.