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ORGANIC FARMING: BENEFICAL TO PREDATORY MITES IN FRENCH VINEYARDS.

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INTRODUCTION.

Typhlodroms prospections in vineyards have been generalized in France for three years, under the coordination of SPV (French Departement for Plant Health) and ITV (Technical Institute for Wine and Vines). The cooperation with ITAB (Technical Institute for Organic Farming) made possible the comparison in most areas of organic to conventionnal vines.

1. METHODS.

. 50 leaves are collected at random in the grape area, and are immediately carried in a cooled tank to the laboratory;

. Mite extraction can be realized by two means:
- Berlese-funnel: leaves are set in a funnel, closed and surmonted by a heating lamp. Mites fall in a can containing diluted alcohol. After a one week-extraction, they are identified and counted.
- mite extraction by leaf-brushing (with rotative brushes): the extraction is much faster (15 mn).

. Mite populations are classified in main categories (damageous mites = Panonychus ulmi, Eotetranychus urticae ..., benefical mites = phytoseids, neutral mites = tydeids), expressed in average leaf density (average number of individual per leaf).

2. MAIN RESULTS.

Phytoseids present on french vines have been identified: northern vineyards are mainly colonized by T. pyri, and southern vineyards by K. aberrans.

Their distribution in vines is very variable. There are several causes to this variability:

. variety: generally, varieties with hairy leaves, such as riesling, carignan, macabeu, picpoul, syrah, host higher populations than sleek ones (grenache, cinsaut, sylvaner...).

. micro-area: in every vine growing area, some micro-areas are more densely colonized than others.

. field surrounding: the neighbourhood of natural reserves of phytoseids (hedges, brambles, trees, reservoir-vines...) is favourable to phytoseid colonization.

. plant protection programm seems to be the main cause. All comparisons of phytoseids density to plant protection programm lead to the same conclusion:
- vines suffering non selective treatments have definitively lower phytoseid populations than the others (fig 1);

- organically grown vineyards are much richer than the average (table 1)

Table n°1: Comparison of typhlodrom populations in organic and conventionnal vines.

Area	Year	Conventionnal vines	Organic vines
Provence	1992	24 vineyards density : 0,3	6 vineyards density : 1,3
Aquitaine	1992	150 vineyards 20-50% occupied	22 vineyards 100% occupied
Bergerac	1991	7 vineyards 13% occupied	8 vineyards 100% occupied
Gironde	1991	16 vineyards 33% occupied	3 vineyards 100% occupied
Languedoc	1991	53 vineyards 68% occupied	23 vineyards 92% occupied
Aude	1991	19 vineyards 47% occupied density : 0,7	12 vineyards 92% occupied density : 1,15
Aude	1990	14 vineyards 36% occupied density : 0,2	12 vineyards 83% occupied density 0,4

In Languedoc-Roussillon, a comparison was led between 3 types of vineyards:
- organic vineyards,
- conventionnal vineyards without any insecticide nor acaricide (without IAC),
- conventionnal vineyards with insecticides and/or acaricide (with IAC).

Phytoseid populations decrease from the first group to the third (table 2).

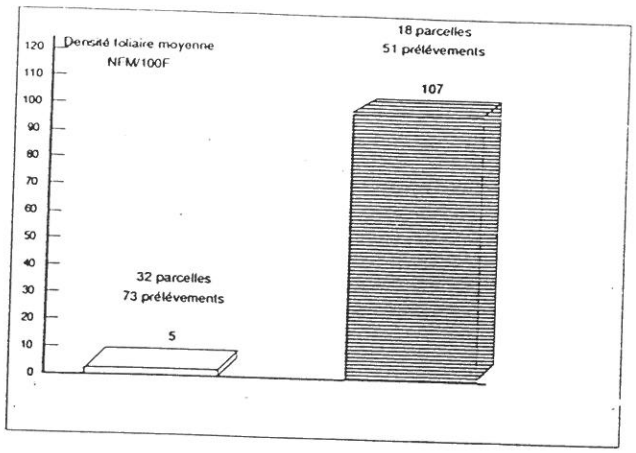
Table n°2 : Influence of plant-protection program on phytoseids in Languedoc-Roussillon.

Plant Protection	Number of vines	% vines with phytoseid densities higher than 0,5	2
ORGANIC	23	56%	51%
WITHOUT IAC	16	38%	13%
WITH IAC	37	35%	24%

(SRPV, CIVAM BIO LR)

In Bordeaux, a similar comparison was led between organic vines (B1, B2), vines with integrated protection (R1, R2), and general average, all types of vines altogether (E1, E2), with the same conclusion favourable to organic vines (fig 2).

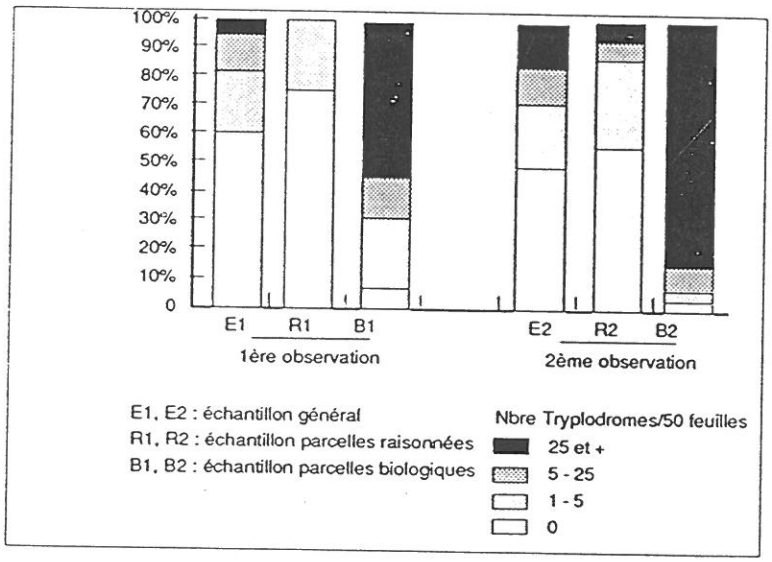
Figure 1: Influence of phytoprotection program on phytoseids (ITV Beaune)



Left: non selective pesticides (dithiocarbamate, non selective insecticides and acaricides)

Right: selective pesticides.

Figure 2: Typhlodroms density in Entre-Deux-Mers (SPV-ITV).



3. INFLUENCE OF PESTICIDES USED IN ORGANIC FARMING ON PHYTOSEIDS.

Although observations show that 80 to 100 % of organic vines host phytoseids, a small minority are empty. That means that even in organic farming, some practices and treatments can be harmful towards phytoseids.

Actually, pesticides toxicity towards phytoseids in organic farming vary from very low to very toxic (table 3).

Repeated use of plant extracted insecticides, such as rotenone, pyrethrum, nicotine, might destroy an important number of phytoseids, and eventually make them disappear.

Potassio permanganate ($KMnO_4$) has probably a similar effect, although its toxicity has not actually been tested. Winter pulverisations should not be dangerous, because phytoseids are

deeply buried under the corks at this time. But summer treatments, against oïdium (powdery mildew) might be damageous for phytoseids.

Use of these pesticides could be a cause of phytoseid disappearance in organic farming.

The effects of fungicides such as copper and sulfur are more unsettled. High treatment levels definitively decrease the phytoseid populations. In Languedoc-Roussillon, there was a sensible reduction of population levels, on the same vineyards, from 1991 (6 to 8 treatments in the year in average) to 1992 (10 to 12 treatments in average, mainly with copper pulverisations against dawny mildew). But this reduction never led to total disappearance of phytoseids on any vineyard.

Table n°3 : Toxicity of some fongicides and insecticides used in organic farming towards phytoseids (typhlodromes)

Type	Nature	Example	Toxicity
Insecticide	Bacillus thuringiensis	Bactospeine, Dipel	1
	Mineral oil	Seppic vigne	1
	Nicotine	Hypnol	3 - 4
	Pyrethrum + rotenone	Biophytoz	4
Fongicide	Copper	Several marks	1
	Wettable sulfur	" "	
	0,2 %		1
	0,5 %		3
	Powdery sulfur	"	2 - 3

Légende

1 : neutral or slightly toxic : reduction of 0 to 40% of phytoseid population
2 : little toxique : reduction of 40 to 60% " "
3 : toxic : " of 60 to 80% " "
4 : very toxic : " of 80 to 100% " "

From : - "Les actions secondaires des produits phytosanitaires" 1983 SPV et UIPP éditeurs 5ème édition
- " Influenza degli antiparassitari sulla fauna utile in fritticoltura" Verona Venezia 29-31/5/1985. Paolo Mori édition.
- S. KREITER INRA Montpellier.

If copper is said to be unharmful towards phytoseids, sulfur is more a problem: laboratory tests class it as slightly toxic to toxic. It seems to depend highly on sulfur concentration (table 3).

1991 was in Languedoc-Roussillon very favourable to oïdium (Uncinula necator), and organic wine growers realized up to 8 or 9 treatments with sulfur (either wettable or powdery) to protect their vines against it.

Comparison of phytoseid populations to oïdium protection program showed that important use of sulfur does not seem to disturb phytoseids in field conditions (table 4).

Different field trial led to similar results (table 5).

Several hypothesis can explain this apparent contradiction between laboratory tests and field observations:

. wine growers actually rarely use full dose, particularly of wettable sulfur: in practice, they use 8 to 10 kg/ha, instead of 12,5 kg/ha, which is the official norm in France for wettable sulfur.

. there might be a difference of toxicity towards phytoseids between the different commercial marks of wettable sulfur sold in France.

. phytoseids are caracterised by a high genetical variability. Frequent sulfur pulverizations probably select sulfur-tolerant phytoseid varieties, in the same way as deltamethrine- and parathion-resistant phytoseids have already been found. Some trials show that sulfur is more toxic on phytoseids collected in vineyards receiving no or little sulfur.

. sulfur is toxic on all types of mites, either predatory or phytophageous. Sulfur, and particularly powdery sulfur, exerces globally a repressive effect on P. ulmi and E. tetranychus in field conditions.

Table n°4 : Comparison between oïdium protection program and phytoseid populations on organic vine in Languedoc-Roussillon in 1991 (CIVAM BIO LR).

Variety	Density Typhlodrom (nb/leaf)	Use of sulfur			
		Wettable		Powder	
		Number	Dose	Number	Dose
Cinsaut (2)	6,8 à 7,4	3	8-10 kg/ha	5	20-40 kg/ha
Aramon	4,1	5	6-8 kg/ha	2	20 kg
Ugni blanc	3,9	7	8 kg/ha	-	-
Syrah	2,6	3	6-8 kg/ha	2	25-30
Carignan	3,6	6	6-10 kg/ha	3	15-25
Merlot	0,1	6	6-10 kg/ha	3	15-25
Picpoul (2)	0,8 à 2,1	4	7-10 kg/ha	3	30 kg
Picpoul (2)	0,2	5	6-12 kg/ha	4	50 kg
Maccabeu	0,38	2	6 kg/ha	3	30 kg
Muscat PG.	2,62	3	10 kg/ha	2	30 kg
Grenache/Macabeu	6,76	2	8 kg/ha	2	40 kg
Carignan	4,86	-	-	3	30 kg
Maccabeu	4,68	4	8 kg/ha	4	40 kg

Table n°5: Side effects of wettable sulfur in vineyards.

Mark	Year	Dose pulv	Nb	Site	Nature of Phytoseid	Effect on Phytoseid	Effect on Mites
THIOVIT	1991	12,5kg/ha	9	Hérault (SRPV)	T.phialatus	-	-
Microthiol	1992	12,5kg/ha	5	Hérault (SRPV)	K. aberrans	0	-
THIOVIT	"	12,5kg/ha				- -	-
HELIOSOUFRE	"	7,51/ha				-	-
THIOVIT	1992	8 kg/ha	1	Bourgo-	T. pyri	0	-
HELIOSOUFRE		4,81/ha	1	gne ITV		-	-
HELIOSOUFRE		8,41/ha				?	

0 = no toxicity
- = little toxicity
-- = high toxicity

4. CONCLUSION.

Organic wine-growers have been proving to the french wine community that the respect of ecological equilibrium is necessary and sufficient to protect phytoseids and avoid mite attacks. But the respect of organic specifications can present some danger for phytoseids. Natural insecticids, such as pyrethrum, rotenone or nicotine should not be used (anyway, they are useless in viticulture against eudemis or cochylis). Sulfur should be used with caution. Organic wine growers should avoid to use more than 9 kg/ha of wettable sulfur (per treatment), as recommended by Mr BAILLOD in Swiss. But sulfur is absolutely necessary, and at sufficient levels, to protect vineyards against oïdium (powdery mildew), particularly in areas where this disease is important.

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SUMMARY.
Surveys realized in different french vineyards showed that organic vines have important populations of phytoseids, which protect them against mite attacks. Nevertheless, some practices in organic farming can be dangerous for phytoseids, particularly the use of natural insecticides, and at a lower degree, the use of sulfur. Field observations are contradictory to laboratory tests concerning the toxicity of sulfur against phytoseids.