THE IMPACT OF PHYTOSANITARY PRODUCTS ON THE QUALITY OF GRAPES AND WINES

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The phytosanitary products are the medicines of plants

These have been designed for prevention or curative purposes as well as human medicines, but only when other preventive means have been exhausted

What happens after pesticide application?	
benefits	**disadvantages**
Control specific pests	Contaminate air, water and soil
Degrade into harmless compounds	Persist in the environment
Move to target area, such as roots	Injure nontarget plants and animals
Increase production	Contaminate food
	Effect nontarget microorganisms and

Inorganic compounds based on copper

$Cu_2Cl(OH)_3$

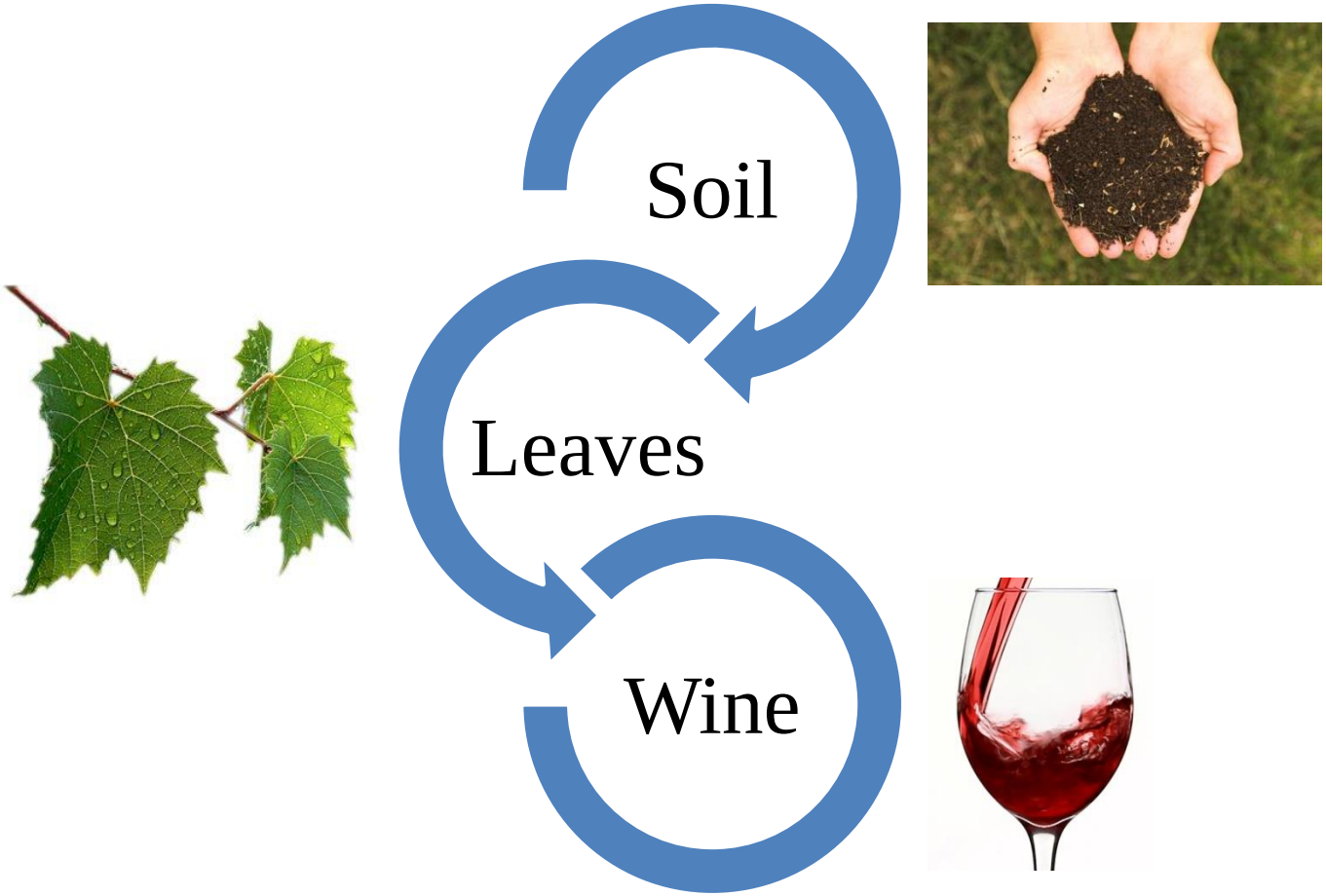
Cu_2O

$CuSO_4$

$Cu(OH)_2$

Cu

Accumulation of copper



Copper in soil

Inorganic copper compounds have been widely used for a long time as fungicides against downy mildew (Plasmopara Viticola).

- One of the most versatile microelements.

In soil, copper is accumulated mainly in the upper layer because of its tendency to bind carbonates, organic matter, hydrated oxides of Fe, Al, and Mn.

The values of total content of copper in vineyard soils

Country	Range (mg/kg)	References
Southern France	30-250	BRUN, L.A., MAILLET, J., RICHARTE, J., HERMANN, P., REMY, J.C.,Environ. Pollut. 102, 1998, p.151-161
Alsace	400-500	FLORES VELEZ, L.M., DUAROIR, J., JAUNET, A.M., ROBERT, M.,European Journal of Soil Science, 47, 1996, p.523-532
Bordeaux	up to 800	DELAS, J., Agrochimica, 7, 1963, p.258-288
Taiwan	9.1-100	LAI, H.-Y., JUANG, K.-W., CHEN, B.-C., Soil Science & Plant Nutrition, 56(4), 2010, p.601–606
Australia	10-250	PIETRZAK, U., McPHAIL, D.C., Geoderma, 122, 2004, p.151-166
Italy	2-375	FREGONI, M., CORALLO, G., 5, 2001, p.35-43

Copper in soil

pollution level

copper total content in soils

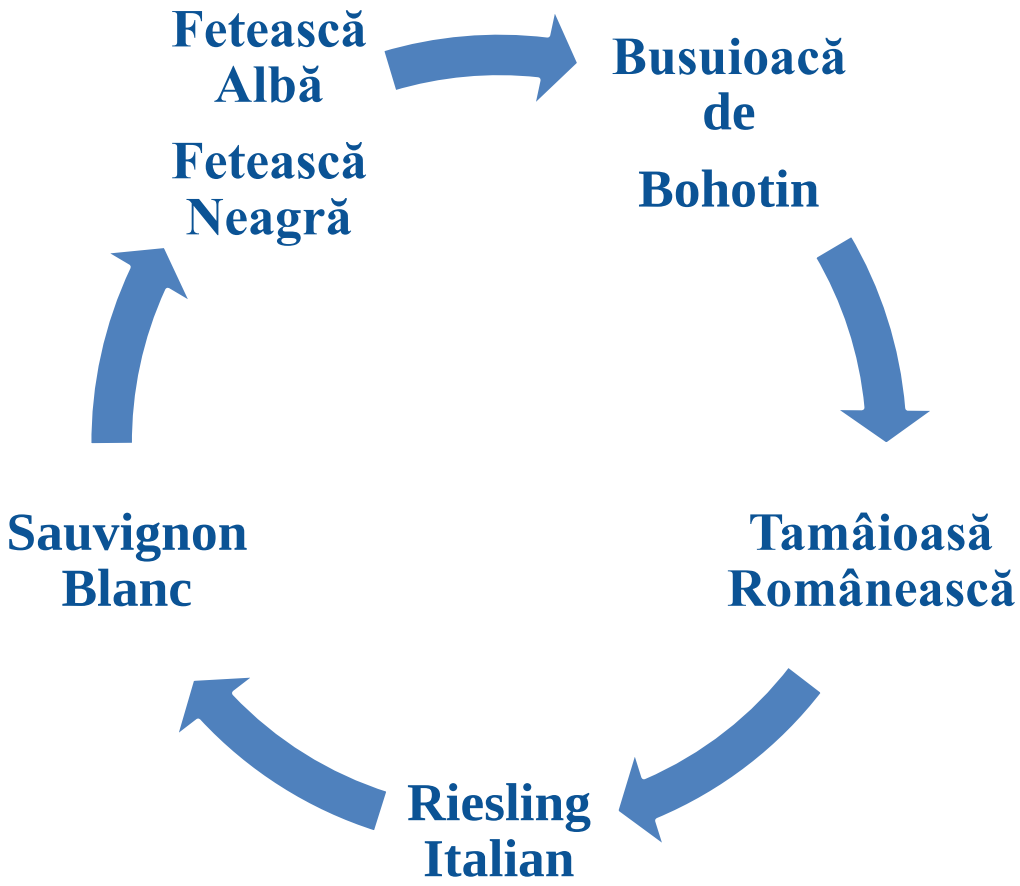
Copper in soil

- Availability of copper accumulated in vineyards
- Assessment of the mobile form

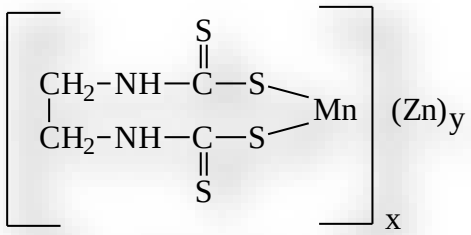
Copper in soil

- Soils in Romania are generally good and very well stocked with both total Cu and Cu mobile.
- According to Romanian legislation, maximum allowable level for total copper content from soil is 20mg/kg, alert threshold is set at 100mg/kg for sensitive areas (residential and agricultural).
- Copper mobility along the soil profile and bioavailability for root uptake depend on soil pH, cation exchange capacity, organic matter, texture.

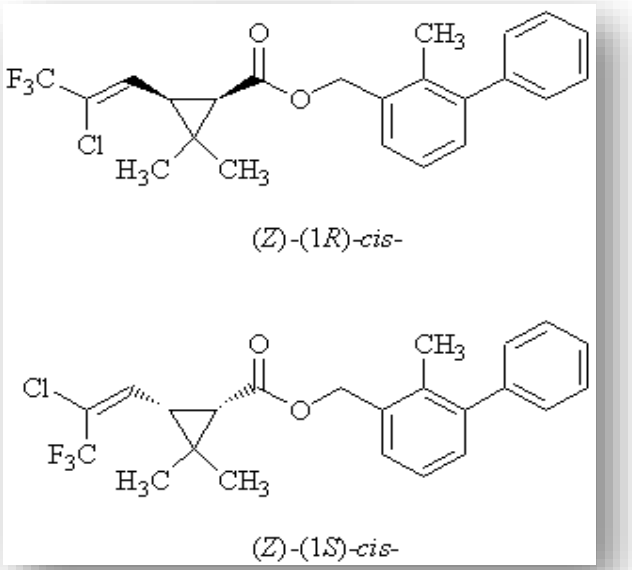
Varieties of wines from Tohani-Dealu Mare



The first phytosanitary treatment



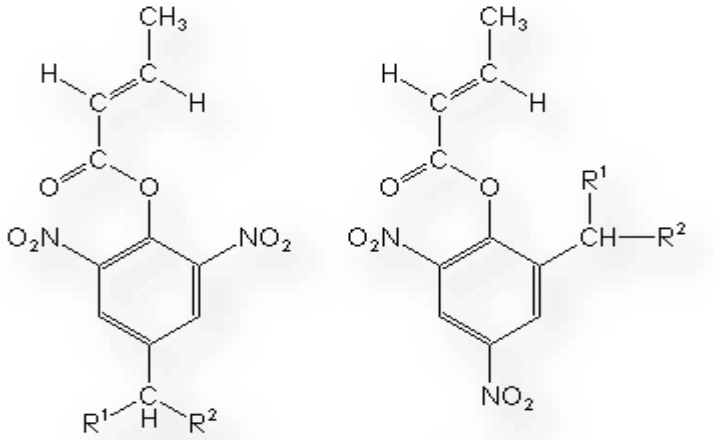
Mancozeb

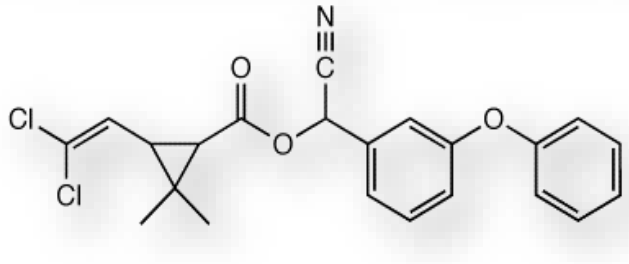


Bifentrin

- The first phytosanitary treatment includes substances such as Mancozeb, Bifentrin but very important is for our research $Cu_2Cl(OH)_3$

The second phytosanitary treatment

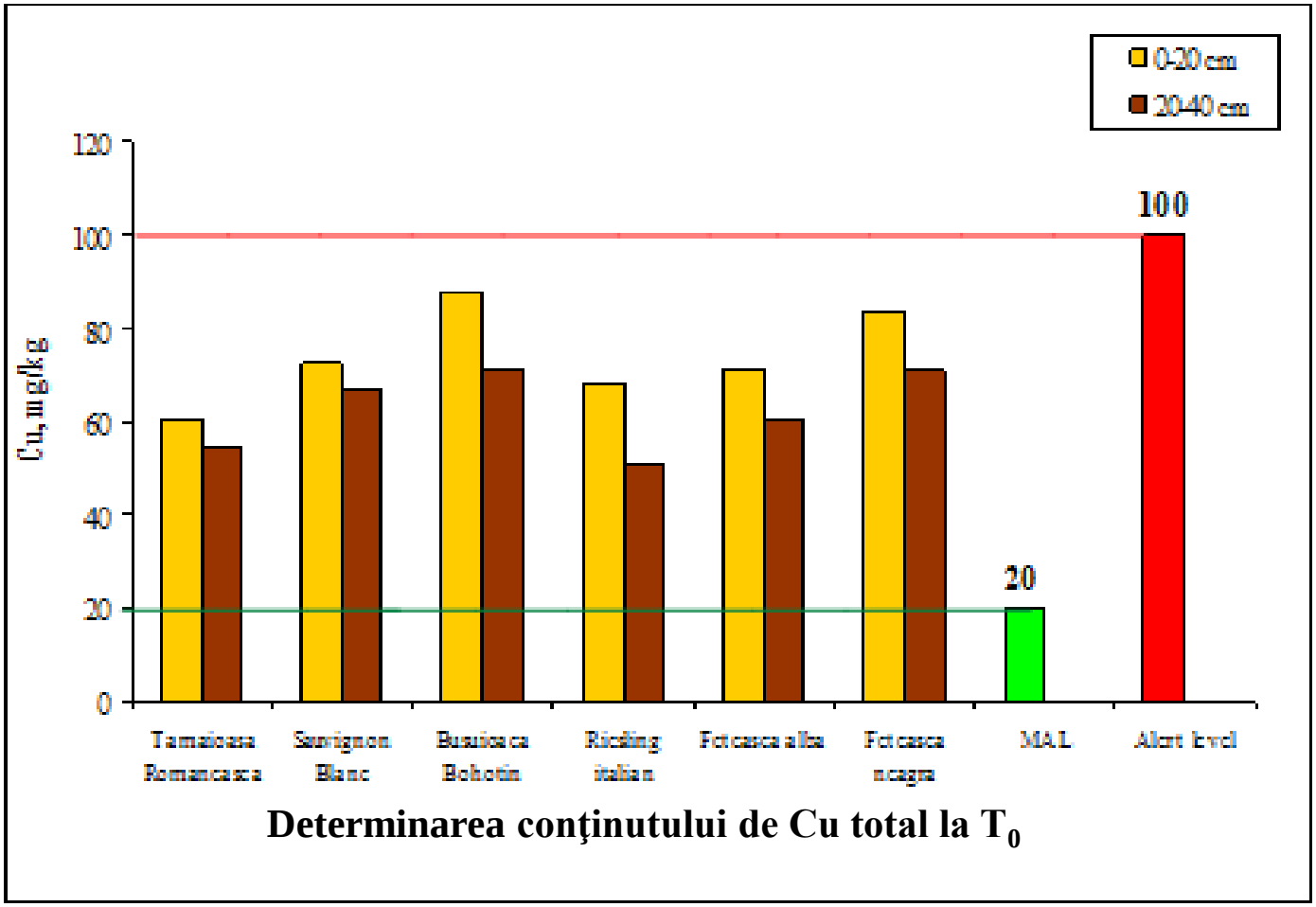




Cipermetrin

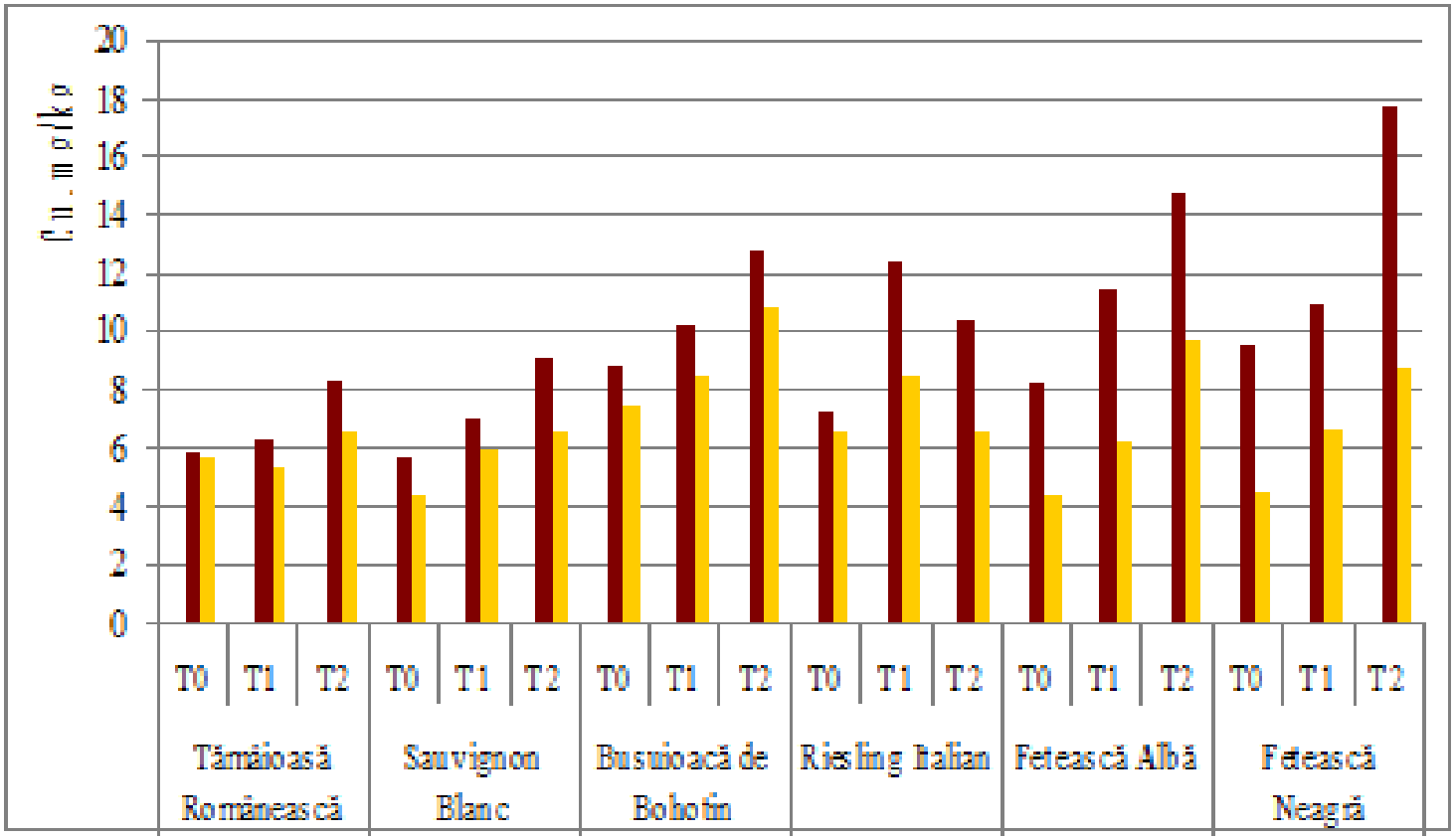
- The second treatment includes organic compounds such as Dinocap, Cipermetrin but it containes an inorganic compound which is very important for our research, $Cu(OH)_2$
- Very important is that the second treatment was applied after two weeks latter

Total content of copper from soil (0-20 cm, 20-40 cm)



Determinarea conţinutului de Cu total la T_0

Mobile form of copper content from soil (0-20 cm, 20-40 cm)



Determinarea conţinutului de Cu mobil la T_0, T_1, T_2

Accumulation of copper in leaves

The absorption of copper by plants is the lowest as compared to other micronutrients B, Fe, Mn and Zn.

- The soil absorption is active and occurs in ionic form, Cu^{2+} and chelated form.

With maximum intensity occurs when the plants are young.

Accumulation of copper in leaves

Proba analizată (frunză)	Tratament aplicat	Cu, mg/kg
Tămâioasă Românească	T_1	0,35
	T_2	1,74
Sauvignon Blanc	T_1	0,06
	T_2	3,37
Busuioaca de Bohotin	T_1	0,40
	T_2	3,35
Riesling Italian	T_1	‹ DL
	T_2	‹ DL
Fetească Albă	T_1	‹ DL
	T_2	**3,92**
Fetească Neagră	T_1	‹ DL
	T_2	2,97

Copper in wine

The copper content is correlated with wine quality.

High levels of copper can cause spoilage leading to pinking of red wine as well as haze formation.

Copper in wine

Symptoms of copper poisoning include nausea, vomiting, abdominal and muscle pain.

Copper becomes toxic in amounts higher than 2-3 mg/day.

Copper in wine

In our country is a long tradition to produce and consume wine.

According to **International Organisation of Vine and Wine**, the maximum allowable limit of copper in wine is 1 mg/L.

Copper in wine

Probe de vin	Anul	Cu, mg/L (min-max)	$\overline{X} \pm SD$	CV, %
Tămâioasă Romanească (alb)	2017	0,239-0,317	0,286±0,034	11,91
	2018	0,235-0,400	0,297±0,074	24,46
	2019	0,313-0,404	0,347±0,042	12,26
Sauvignon Blanc (alb)	2017	0,254-0,420	0,342±0,068	19,92
	2018	0,262-0,422	0,306±0,077	25,19
	2019	0,195-0,352	0,255±0,068	26,95
Riesling Italian (alb)	2017	0,394-0,522	0,442±0,055	12,51
	2018	0,346-0,419	0,373±0,032	8,60
	2019	0,426-0,534	0,482±0,048	10,16
Fetească Albă (alb)	2017	0,412-0,572	0,492±0,070	14,22
	2018	0,396-0,514	0,463±0,049	10,75
	2019	0,508-0,605	**0,538±0,044**	8,31
Busuioacă de Bohotin (rosé)	2017	0,244-0,325	0,295±0,035	12,09
	2018	0,402-0,506	0,454±0,046	10,30
	2019	0,282-0,354	0,318±0,029	9,26
Fetească Neagră (roșu)	2017	0,096-0,146	0,122±0,022	18,30
	2018	0,132-0,221	0,184±0,039	21,43
	2019	0,186-0,254	0,214±0,029	13,90


Thank you for your attention!