Control of Vine Powdery Mildew by the use of EM Preparations

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Abstract
The possibility of controlling the vine powdery mildew caused by the fungi *Unicinula necator* (Schw.). Burr. Is studied by the use of EM preparations acceptable in organic vineyard for grape protection.
In this paper results of the first experiment with EM preparations in Yugoslavia are presented. The experiment was conducted during cultivation period, in the year 2000, and Riesling Italian vine cultivar was used. Totally 7 treatments were performed. The first spraying was conduced at the vegetative shoots stage 15 (EL stage scale). Preparations EM-1 and EM-5 were used in 5.0 % and 0.2 % concentration respectively. Combinations of these two products were also tested. Conventional fungicide combinations (propiconazole 0.15% + sulphur 0.2% + mankozeb 0.2%) and plant extract prepartion Urticum in combination with Humisin (1.0% + 1.0%) were used as the reference products. The efficiency of spraying by EM-1, EM-5 and with combination of both products were 98.91%, 97.64% and 98.28% respectively. The efficacy of spraying by combination of fungicides was higher, while there was no statisticaly significant, compared to the EM products and plant extract preparation. The wines were produced from the grape from experimental plots. The wine produced from the grape protected with EM-1 prepration had the best sensory characteristic, specially aroma and taste. The results of this one year study shown that EM preparations can be used for the control of vine powdery mildew with positive effect on grape and wine quality.
Keywords: *Organic viticulture, Uncinula necator, EM preparation, efficacy*

Introduction

The pathogen *Uncinula necator* causes a widespread persistant disease of grapevine in world vineyards. It often causes major crop loss and decreases wine quality. Organic viticulture more or less depends on the use of sulphur against powdery mildew to ensure a sufficent success with respect to health and quality aspects of grapes. Even sulphur, a product acceptable in organic farming have the disadvantages of the residues remainnig in the wine and the irritation caused to the people that use it.
Efforts are made letely towards the use of the compost extracts in control *U. necator* in organic viticulture. Other substances used as sprays by organic growers such as sodium silicate and rapeseed oil/ Fischer-Timborn *et al*, 2000. According to Hofmarn's (2000) results, spraying of lactic-bacterialextract on the soil in the vineyard increase a higher biological activity and higher populations of antagonists.
Effective Microorganisms (EM), a mixture containing lactic acid and photosyntetic bacteria and yeast, isolated from the respective ecosystems and not just from single source (Sangakkara and Higa, 2000). The use of EM-1 in combination with fungicides aganst powdery and mildews and grey mould in the vineyard Espelta and Chujo (1999) underlined.
The aim of this study was to investigate the possibility of controlling the pathogen *Uncinula necator* by the use of EM preparations and effect by this protection on wine quality.

Materials and methods

The experiments were conducted with Riesling grape variety at the state owned stock company "Navip-Fruskogorac" and lasted one cultivation period. Comparative investigation with biological, plant extrct and fungicide preparations against powdery mildew was done.

The stock solution of biological preparation EM-1 and EM-5 we got from "Multicraft", Haiding, Wels, Austria. Extended secondary solutin of EM-1 and EM-5 were tested in 5.0% and 0.2% concentration respectively. Combination of two product were also tested (in ratio 1:1) Conventional fungicide combination (propiconazole 0.15% + sulphur 0.2% + mankozeb 0.2%) and plant extract preparation "Urticum" in combination with "Humisin" (1.0% + 1.0%) were used as the reference products.

The preparation "Urticum" is formulated by extraction of bioactive materials (essential and aromatic oils) from a mixture of medicinal and spice plants and "Humiin" is a concentrate of special types of lumbrico humus, formulated in the private company "Biolabor", Subotica, Yugoslavia.

Tottaly 7 treatments were performed every 12 days in the year 2000. The first spraying was done at the vegetative stage 15 (EL stage scale).

Application treatments were made using a small plot precision knapsack sprayer. Spray volumes ranged from 1000-12001/ha. Plot size was $90m^2$ in three replication. Diseae evaluations consisted of visual assesments f percentage area infected on the bunches. The efficacy of each treatments was calculated with Abbot's test.

Wines were produced from selected plots. Quality, basic chemical compounds of wines were detected by official methods Recueil d' OIV, 1990.

Sensory evalutions of wines was done in Blind-Testings by three expert testers. Quality paramether of wine were tested using the point method: Clearnes (0-2) colour (0-2) aroma (0-4) nd taste (0-12) points.

Results and disscusion

In the one year investigted period good results were achieved in efficacy against downy mildew by applaying EM preparations in grapevine protection. The efficacy of EM preparation to control pathogen *U. necator* was ranged from 97.64% EM-5, 98.28% EM-1 +EM-5 and 98.91% EM-1. There was no statistical significant difference in efficiency between EM products, plant extract preparation and combination of fungicides. Powdery mildew wa well controlled by EM preparations in the medium infection rate (51.43) redusing the disease severity on ripening bunches. (Table 1.)

Table. 1 Efficacy of EM preparations on the control of powdery mildew in grapevine

Tretments	Powdery mildew	
	DSI	E
A Control	51.43	0.00
B Fungicides (combination)	0.88	99.04
C Urticum + Humisin	0.99	98.72
D EM-1	0.95	98.91
E EM-5	1.02	97.64
F EM-1 + EM-5	0.89	98.28

$p<0.05$ DSI – disease severity index E – efficacy (%)

In the last seven years disease pressure was high (Robotic *et al* 2000) with powdery mildew in Fruska Gora vineyard region except in the year 2000. Will EM preparation be able to provide

sufficient level of protection against *U. necator* in above mentioned circumstances, at high level of infection, is the subject for further investigation.
In Table 2 are represented the analysis of the wines produced from the grapes pretected with EM preparations. The analytical data of white wine Riesling show that the alcohol content is highest in wines product from grapes protected with EM-1 and EM-5 respectuely.

Table 2. Basic chemical composition of wnes

	A	B	C	D	E	F
Alcohol content, %v/v	9.63	10.55	10.50	12.78	12.26	11.21
T otal extract g/l	22.20	20.10	23.20	27.40	21.90	22.90
Sugar free extract g/l	20.10	22.20	23.20	22.20	21.90	22.90
Sugar g/l	-	-	-	5.20	-	-
Total acidity g/l	7.00	7.50	7.90	6.90	7.00	6.50
Volatile acidity g/l	0.39	0.36	0.36	0.31	0.37	0.37
pH	3.10	3.06	3.05	3.12	3.10	3.14
Ash mg/l	1.89	2.06	2.32	2.01	1.98	1.95
Total SO_2 mg/l	35	33	32	35	44	46

Also, according to Espelta and Chujo (1999) results difference in alcohol degree between treated with EM-1 and untreated was found. Treated with EM-1 had 0.5 more alcohol degree than untreated with EM-1.
The sensory evaluation, Table 3., show that the wines produced from grapes protected with EM-1 had the special aroma and taste with fruity and floral taste and good freshnes, and was the best evaluated from selected wines (16.40 points).

Table 3. Sensory characteristics of wines

Variants	Clearnes (0-2)	Colour (0-2)	Aroma (0-4)	Taste (0-12)	Total points (0-20)	Note Remark
A	2.0	2.0	2.5	8.0	14.5	strong quince taste, opalescent
B	1.8	2.0	2.5	8.5	14.8	strong fruity taste, bitterness
C	2.0	2.0	3.2	8.0	15.2	strong herbaceous taste
D	2.0	2.0	3.2	9.2	16.4	floral and fruity taste
E	2.0	2.0	2.5	9.0	15.5	strong fruity taste
F	2.0	2.0	3.0	9.2	16.2	fruity taste

Dupin *et al* (2000) found that wines produced according to the organic viticultural practices tended to be in average less aromatic (less fruity and floral characters, and weaker taste atributes) than the conventional ones as well as being significantly lower for the vegetal character (herbaceous, greenbeans attributes).
But in contrary, to above mentioned results we got in our experimet organic wine with floral and fruity taste from the grape protected with EM-1 preparation.

Conclusion

EM preparations, EM-1, EM-5 and combinations of both were highly effective against powdery mildew under medium level of infection in the field conditions, and seem to increase wine quality and some sensry characteristic. Further investigatin are necessary to evaluate:

- Eficiency under the high level of infection

- Treatment interval and combinations with other preparations accetable in organic viticulture
- Responses of different grape varieties
- Efects on wine quality and apecially sensory characteristcs

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