

# A21-010-890FE

## Efficacy of ozone applied alone and in mix, against *Plasmopara viticola* on grape, Italy 2021

Trial ID: A21-010-890FE Location: Italy Trial Year: 2021  
Protocol ID: 890A21FE9 Investigator (Creator): Sergio Spitaleri  
Project ID: Study Director: Antonio Russo  
Official Trial ID: A21-010-890FE Sponsor Contact: Federico Ponti  
Trial Origin: C contracted trial

## TREATMENT LIST

Trt No.	Type	Treatment Name	Form Conc	Form Unit	Form Type	Description	Rate	Rate Unit	Appl Code	Comment 1	Comment 2
1	CHK	Untreated Check									
2	FUNG	Ozone			SN		5ppm pr		ABCDEFGH	500-1200 L/ha	Spray application with water
3	FUNG	Kocide 2000	35%		WG		200g/100 l		ABCDEFGH	500-1200 L/ha	Spray application
4	FUNG	Ozone			SN		5ppm pr		ABCDEFGH	500-1200 L/ha	Apply Kocide 2000 after Ozone on dry leaves
	FUNG	Kocide 2000	35%		WG		200g/100 l		ABCDEFGH	500-1200 L/ha	
5	FUNG	Ozone			SN		5ppm pr		ABCDEFGH	500-1200 L/ha	Ozone spray application in emulsified sunflower oil with water
	FUNG	Sunflower oil			EC	Rate 1-5 %V/V	1% v/v		ABCDEFGH	500-1200 L/ha	
6	FUNG	Sunflower oil			EC	Rate 1-5 %V/V	1% v/v		ABCDEFGH	500-1200 L/ha	Spray application

## OBJECTIVES

### Objectives:

- Do the Ozone used alone have efficacy comparable to the standard Kocide 2000?
- Does the addition of Ozone to the standard Kocide 2000 increase the efficacy of Kocide 2000 used alone?
- Does the addition of Ozone emulsified Sunflower oil increase the efficacy of Ozone used alone?
- Are all treatments safe for the crop?

# SITE DESCRIPTION

<b>Trial Location</b>			
<b>City:</b>	MASSA LOMBARDA	<b>Country:</b>	ITA Italy
<b>State/Prov.:</b>	Ravenna RA	<b>Region:</b>	ER
<b>Postal Code:</b>	48024	<b>Climate Zone:</b>	EPOMED EPPO Mediterranean

<b>Crop Description</b>			
<b>Crop 1:</b>	C VITVI Vitis vinifera	European Grape	<b>BBCH Scale:</b> BGRA
<b>Entry Date:</b>	Sep-27-2021	<b>Stage Scale:</b>	BBCH
<b>Variety:</b>	Trebbiano Romagnolo	<b>Planting Rate:</b>	10 P/PLOT
<b>Perennial Age:</b>	17 YR	<b>Planting Density:</b>	2604 P/ha
<b>Rows per Plot:</b>	1	<b>Planting Method:</b>	TRAMAC transplanted - machine
<b>Row Spacing:</b>	3,2 m	<b>Planting Equipment:</b>	MT transplanter, mechanical
<b>Spacing within Row:</b>	1,2 m	<b>Soil Moisture:</b>	GOOD good
		<b>Plant Arrangement:</b>	ROW

<b>Pest Description</b>			
<b>Pest 1 Type:</b>	D	<b>Code:</b> PLASVI	Plasmopara viticola
<b>Common Name:</b>	Downy mildew of grapevine		<b>Stage Scale:</b> BBCH

<b>Site and Design</b>			
<b>Treated Plot Width:</b>	3,2 m	<b>Total Plot Width:</b>	3,2 m
<b>Treated Plot Length:</b>	12 m	<b>Total Plot Length:</b>	12 m
<b>Treated Plot Area:</b>	38,4 m <sup>2</sup>	<b>Treatments:</b>	6
<b>Replications:</b>	4	<b>Site Type:</b>	FIELD field
<b>% Slope:</b>	0	<b>Experimental Unit:</b>	1 PLOT plot
<b>Untreated Arrangement:</b>	INCLUDED	<b>Tillage Type:</b>	CONTIL conventional-till
<b>Block Arrangement:</b>	BSSPSS	<b>Study Design:</b>	RACOBL Randomized Complete Block (RCB)
			single control randomized in each block
			all blocks side by side, plots side by side

<b>Soil Description</b>			
<b>% Sand:</b>	52	<b>% OM:</b>	1
<b>% Silt:</b>	29	<b>pH:</b>	7,8
<b>% Clay:</b>	19	<b>Texture:</b>	L loam
<b>Soil Drainage:</b>	G good	<b>Soil Name:</b>	LOAM
		<b>Fert. Level:</b>	G good

<b>Application Description</b>							
	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>
<b>Application Date</b>	May-4-2021	May-11-2021	May-18-2021	May-25-2021	Jun-1-2021	Jun-8-2021	Jun-15-2021
<b>Appl. Start Time</b>	11:00	9:00	14:00	15:00	9:00	16:00	10:00
<b>Appl. Stop Time</b>	12:00	10:00	15:00	16:00	10:00	17:00	11:00
<b>Interval to Prev. Appl.</b>		7 DAYS	7 DAYS	7 DAYS	7 DAYS	7 DAYS	7 DAYS
<b>Application Method</b>	BROADC	BROADC	BROADC	BROADC	BROADC	BROADC	BROADC
<b>Application Timing</b>	PRAPSY	FIINSP	FIINSP	FIINSP	FIINSP	FIINSP	FIINSP
<b>Application Placement</b>	FOLIAR	FOLIAR	FOLIAR	FOLIAR	FOLIAR	FOLIAR	FOLIAR
<b>Applied By</b>	Spitaleri	Spitaleri	Spitaleri	Spitaleri	Spitaleri	Spitaleri	Spitaleri
<b>Appl. Entry Date</b>	Sep-28-2021	Sep-28-2021	Sep-28-2021	Sep-28-2021	Sep-28-2021	Sep-28-2021	Sep-28-2021
<b>Air Temperature Start, Stop</b>	18; 18 C	20; 20 C	21; 21 C	23; 23 C	20; 20 C	24; 24 C	27; 27 C
<b>% Relative Humidity Start, Stop</b>	56; 56	48; 48	50; 50	38; 38	45; 45	67; 67	41; 41
<b>Wind Velocity+Dir. Start</b>	0 MPS; -	0 MPS; -	0 MPS; -	0 MPS; -	0 MPS; -	0 MPS; -	0 MPS; -
<b>Wind Velocity+Dir. Stop</b>	0 MPS; -	0 MPS; -	0 MPS; -	0 MPS; -	0 MPS; -	0 MPS; -	0 MPS; -
<b>Wind Velocity+Dir. Max</b>	0 MPS; -	0 MPS; -	0 MPS; -	0 MPS; -	0 MPS; -	0 MPS; -	0 MPS; -
<b>Wet Leaves (Y/N)</b>	N; no	N; no	N; no	N; no	N; no	N; no	N; no
<b>Soil Temperature</b>	17 C	19 C	19 C	19 C	18 C	20 C	21 C
<b>Soil Moisture</b>	SLIDRY	DRY	DRY	DRY	DRY	DRY	DRY
<b>Soil Surface Condition</b>	FINE	FINE	FINE	FINE	FINE	FINE	FINE
<b>% Cloud Cover</b>	0	0	10	20	0	40	0
<b>Next Moisture Occurred On</b>	May-11-2021	May-14-2021	May-19-2021	May-26-2021	Sep-6-2021	Jun-9-2021	Jul-13-2021
<b>Time to Next Moisture</b>	7,0 DAY	3,0 DAY	1,0 DAY	1,0 DAY	5,0 DAY	1,0 DAY	28,0 DAY
<b>Moisture 6 Hours after Appl.</b>	0 mm	0 mm	0 mm	0 mm	0 mm	0 mm	0 mm
<b>Moisture 1 Week after Appl.</b>	0,6 mm	1,8 mm	19,6 mm	0,4 mm	27,2 mm	1,8 mm	17,4 mm
<b>Weather Source</b>	WSLOCAL	WSLOCAL	WSLOCAL	WSLOCAL	WSLOCAL	WSLOCAL	WSLOCAL

<b>H</b>	
<b>Application Date</b>	Jun-22-2021
<b>Appl. Start Time</b>	14:00
<b>Appl. Stop Time</b>	15:00
<b>Interval to Prev. Appl.</b>	7 DAYS
<b>Application Method</b>	BROADC
<b>Application Timing</b>	FIINSP
<b>Application Placement</b>	FOLIAR
<b>Applied By</b>	Spitaleri

<b>Appl. Entry Date</b>	Sep-28-2021
<b>Air Temperature Start, Stop</b>	30; 30 C
<b>% Relative Humidity Start, Stop</b>	38; 38
<b>Wind Velocity+Dir. Start</b>	0 MPS; -
<b>Wind Velocity+Dir. Stop</b>	0 MPS; -
<b>Wind Velocity+Dir. Max</b>	0 MPS; -
<b>Wet Leaves (Y/N)</b>	N; no
<b>Soil Temperature</b>	22 C
<b>Soil Moisture</b>	DRY
<b>Soil Surface Condition</b>	FINE
<b>% Cloud Cover</b>	0
<b>Next Moisture Occurred On</b>	Jul-13-2021
<b>Time to Next Moisture</b>	21,0 DAY
<b>Moisture 6 Hours after Appl.</b>	0 mm
<b>Moisture 1 Week after Appl.</b>	17,4 mm
<b>Weather Source</b>	WSLOCAL

**Comment:**

In trt. 3 , trt. 4, trt. 5 and trt. 6 the standard product was applied by means of knapsack sprayer #188.

Operation pressure: 5 BAR

Nozzle Type: Hollow Cone

Nozzle size: 02

Nozzle spacing: 7 cm

Nozzle/Row: 3

Nozzle calibration: 3620 mL/MIN

Time of application:

- Appl. A: 31.8
- Appl. B: 38.2
- Appl. C: 44.6
- Appl. D: 50.9
- Appl. E: 57.3
- Appl. F: 63.7
- Appl. G: 63.7
- Appl. H: 63.7

**Protocol Application Directions:**

**Time and frequency of application**

Start applications when conditions for the disease occur and applicate before the primary infections.

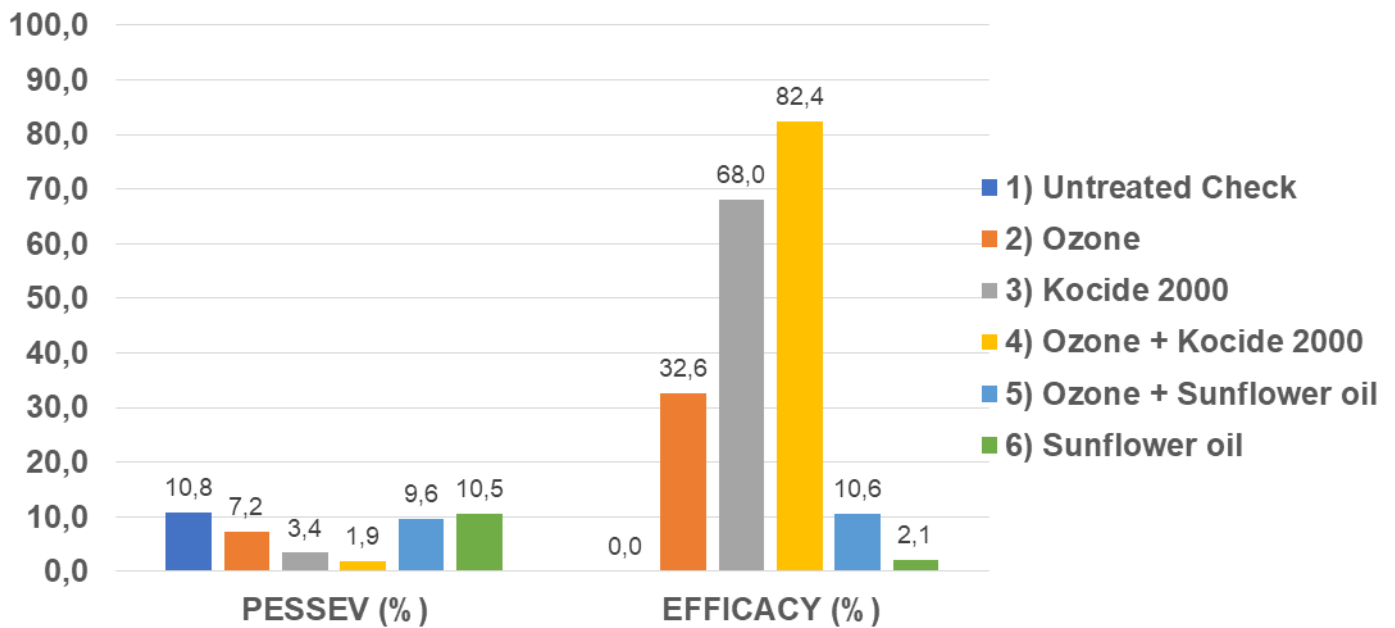
Interval between applications: 4-7 days

**Doses and volumes**

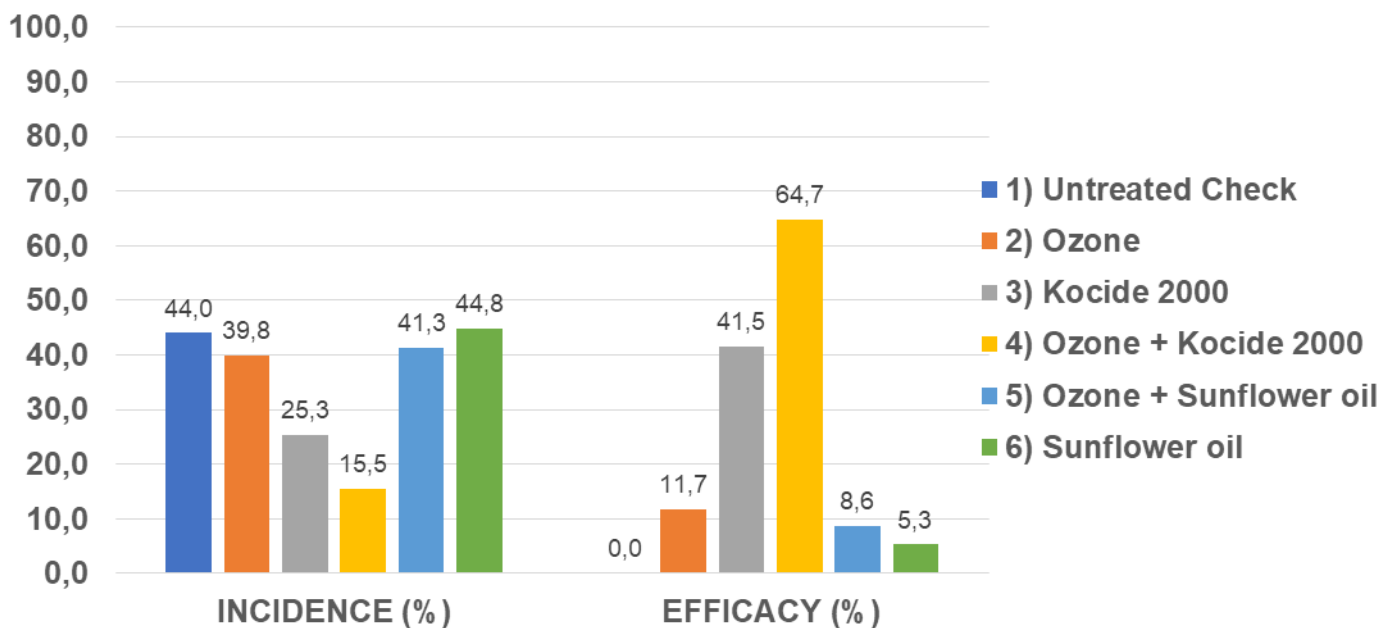
Use water volume variable following crop growth: 500-1200 L/ha

# RESULTS

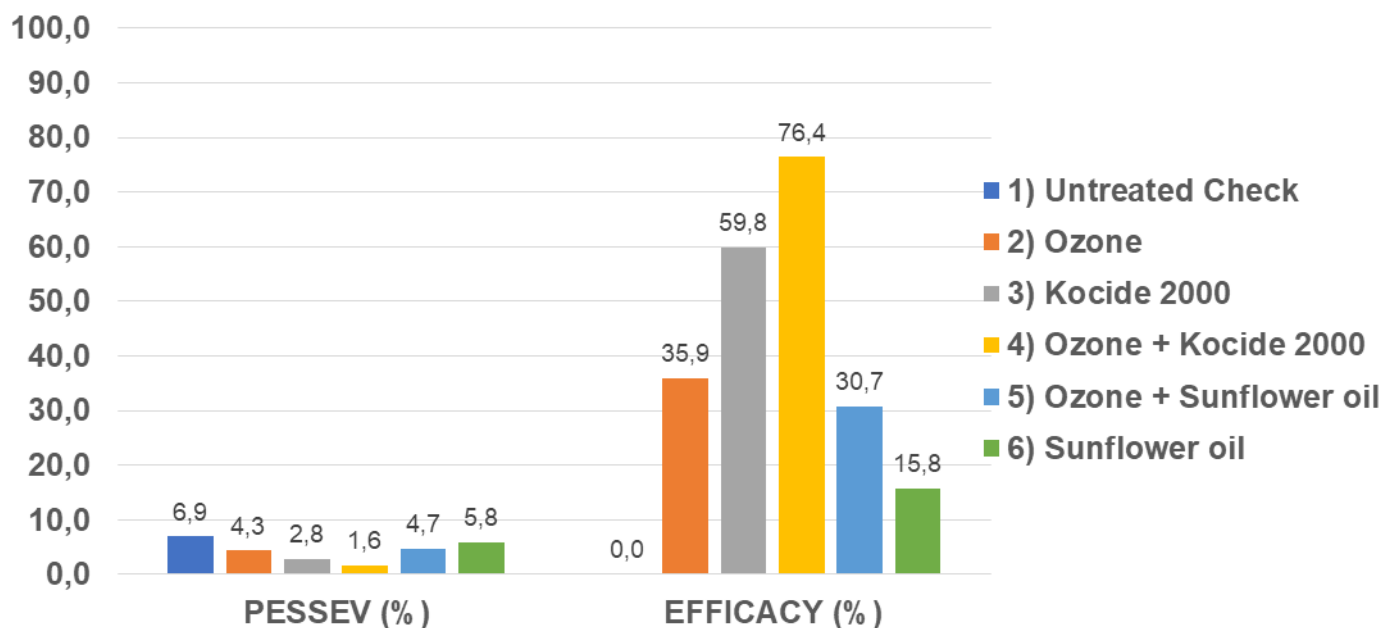
## Severity on leaves – 15 days after last application



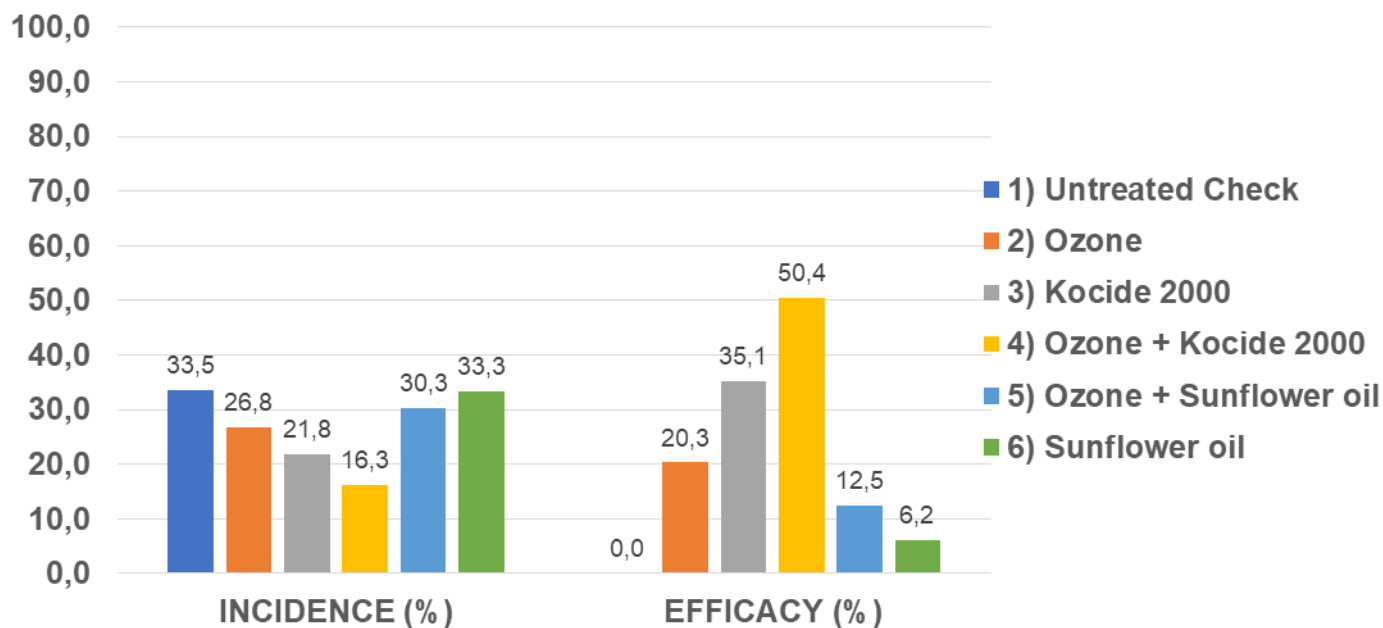
## Incidence on leaves – 15 days after last application



**Severity on bunches – 15 days after last application**



**Incidence on bunches – 15 days after last application**



## COMMENTS

**English version:** At the end of the experimental program for the control of *Plasmopara viticola* on grape, during which 8 applications were carried out based on susceptibility moments of the crop, the untreated check showed a disease severity on bunches equal to 6.94% with an incidence equal to 33.5%. All the products tested in field showed significant results if compared to the untreated check regarding the pest severity. The best result on bunches, was showed by the reference product Kocide 2000 applied in strategy with Ozone with 50.4% of control followed by Kocide 2000 applied alone with 35.1% comparable with the previous one. Ozone applied alone, with 20.3% of control was comparable to the previous one but also with the strategy of Ozone with Sunflower oil (with 12.5%) and Sunflower oil alone (with 6.2%). The addition of Ozone increase the efficacy of Kocide 2000. The strategy of Ozone in emulsified Sunflower oil, do not increase the efficacy of Ozone applied alone.

**Versione italiana:** Al termine della strategia sperimentale per il controllo di *Plasmopara viticola* su vite, durante la quale sono state realizzate 8 applicazioni, basate sui momenti di suscettibilità della coltura, il testimone non trattato ha mostrato una severità della malattia sui grappoli pari al 6.94% con una incidenza pari al 33.5%. Tutti i prodotti applicati in campo hanno fornito risultati significativi rispetto al testimone per quanto riguarda la severità della malattia. Il miglior risultato sui grappoli è stato fornito dal prodotto di riferimento Kocide 2000 applicato in strategia con Ozono con il 50.4% di controllo seguito da Kocide 2000 applicato da solo con il 35.1%, comparabile con il precedente. Ozono applicato da solo, con il 20.3% di controllo, era comparabile con la strategia di Ozono con Sunflower oil (con 12.5%) e con Sunflower oil applicato da solo (6.2%). L'aggiunta di Ozono incrementa l'efficacia di Kocide 2000. La strategia di Ozono in emulsione con Sunflower oil, non aumenta l'efficacia di Ozono applicato da solo.

## CONCLUSION

**Conclusions:**

**English version:** Within the test aimed at controlling *Plasmopara viticola* on grape with the use of organic products, Ozone alone showed efficacy in reducing the disease severity on leaves and bunches compared to the untreated check. Ozone in strategy with the standard Kocide 2000 showed better control of the disease comparable to the standard applied alone. No symptoms of phytotoxicity were observed.

**Versione italiana:** All'interno della prova volta al controllo di *Plasmopara viticola* su vite con utilizzo di prodotti biologici, l'Ozono da solo ha mostrato efficacia nel ridurre la severità della malattia sulle foglie e sui grappoli rispetto al non trattato. Ozono in strategia con lo standard Kocide 2000 ha mostrato il miglior controllo della malattia comparabile allo standard applicato da solo. Non si sono osservati sintomi di fitotossicità.

## CONTACTS

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