Protocol ID:	2021_Amanzi_SA_Fragaria-ananassa_1_Powdery mildew
Investigator:	Amanzi personnel –C. Lehnen-M. Edriss
Study Objective:	Assess differences in powdery mildew control and crop tolerance following applications Euro FolVive Mn Zn Liquid and Kanne Brottrunk

Product List

Treatment	Product	Concentrations	Application rate	Number of applications	Interval
1	Water				
2	Euro FolVive Mn Zn Liquid	0.5 g / L	5 ml / pot	6 or more sprays	7 days
3	Euro FolVive Mn Zn Liquid	1 g / L	5 ml / pot	6 or more sprays	7 days
4	Kanne Brottrunk spray	5 %	5 ml / pot	6 or more sprays	7 days
5	Kanne Brottrunk spray	10 %	5 ml / pot	6 or more sprays	7 days
6	Euro Volvive Mn Zn Liquid + Kanne Brottrunk spray	0.5 g/ L + 5 %	5 ml / pot	6 or more sprays	7 days

1. Materials and Methods

Strawberry plants (Fragaria x ananassa variety CIV H 623 / 413 / 725) were procured on 10 March 2021 from Oekohum.

1 plant per pot, 4 pots per treatment. Plants are kept and looked after in the grow room with grow lights at 22±2 °C earlier then moved to different rooms to provide night / day temperature differences and conditions for the development of powdery mildew.

Treatments before transfer to St-Aubin:

05.02.2021	Water	8	l	
	Stamina S	24	ml	0.30%
	IDHA Copper Eurofins	13	g	0.16%
	Schwefal flüssig	20	ml	0.25%
17.02.2021	Water	8	l	
	Allium Mag	80	ml	1.00%
	Schwefal flüssig	24	ml	0.30%
26.02.2021	Water	18	l	
	Allium Mag	180	ml	1.00%
	Schwefal flüssig	45	ml	0.25%
02.03.2021	Water	20	l	
	Natural green	60	ml	0.33%
05.03.2021	Water	20	l	
	Natural green	60	ml	0.33%

Plants are looked after in the grow room and will be provided best conditions for enhancing powdery mildew (Podosphaera aphanis, formerly Sphaerotheca macularis).

Transplanting date into pots with Oekohum Tonsubstrat mit Kokos : 15 March, watered with 200 ml per pot.

Date	Notes	T	RH %
15-03-21	Transplanting the plants into pots: then they were watered with 200 ml per pot.	22±2 °C	40%
19-03-21	The plants were watered with 200 ml per pot.	22±2 °C	22%
22-03-21	The plants were watered with 2L per tray.night temperatures will be 10 C° to enhance Powdery mildew .	22±2 °C	26%
26-03-21	One gram of fertilizer(Tardit Top) was added per 1 L of water , then the plants were watered with 300 ml per pot .	20C°	29%
29-03-21	The plants were moved to other room and the humidity was increased to enhance the powdery mildew .		
01-04-21	The plants were watered with 1,2 L per tray.	15C°	
06-04-21	The plants were watered with 200 ml per pot. A pesticide (Quassan) was used to control the green aphids on the plants.	15C°	
12-04-21	First round of treatment was conducted according to the protocol. An acaricide (Spomil k) was applied to control the spider mites on the plants. The plants were watered with 1,2L per tray.	22C°	30%
16-04-21	One gram of fertilizer (Tardit Top) was added per 1 L of water, then the plants were watered with 1,2 L per tray (6 plants). An acaricide (Spomil k) was applied to control the spider mites on the plants .	22C°	27%
19-04-21	Second round of treatment was conducted according to the protocol.	15C°	
23-04-21	The plants were watered with 200 ml per pot .	18C°	
26-04-21	Third round of treatment was conducted according to the protocol. The plants were watered with 200 ml per pot .	18C°	
30-04-21	A pesticide (Actara) was applied to control green aphids on the plants. Plants were watered with 200m L per pot.	18C°	
03-05-21	Fourth round of treatment was conducted according to the protocol. The plants were watered with 200 ml per pot .	18C°	
07-05-21	One gram of fertilizer (Tardit Top) was added per pot, then the plants were watered with 250 ml per pot.	18C°	
10-05-21	A pesticide (Quassan) was used to control the green aphids on the plants.	18C°	
14-05-21	An acaricide (Spomil k) was applied to control the spider mites on the plants .then the plants were watered with 200 ml per pot.	18C°	
17-05-21	An evaluation was conducted to figure out the differences between the treatments in terms of differences between the different treatments. A scale of severity of the incidence of the damage to the plants was set from 0 to 100%, 0 = no damage, 100% = plant dead.	18C°	

2. Results and Discussion

Although powdery mildew was present at the onset of the trial, it did not develop in spite of various measures to enhance it. In lieu of powdery mildew mainly spider mites and aphids developed to significant numbers and were controlled with a number of interventions during the course of the test. Powdery mildew may have had a detrimental effect early in the test, yet did not develop further.

The trial was terminated with a final assessment of the plants on 17 May by evaluating the overall damage to the plants by a number of factors. The results can be found in the graph below:

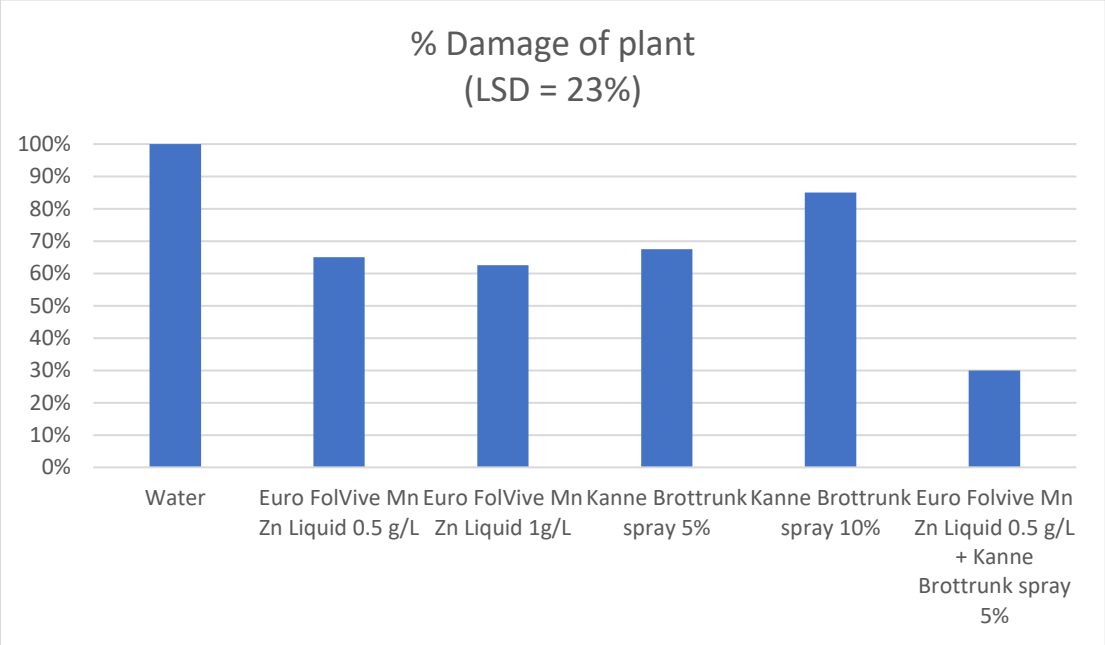

Fig. 1: Final assessment of the damage on strawberry plants by several factors (powdery mildew, spider mites, aphids) on 17 May

All treatments with the exception of Kanne Brottrunk at 10% are significantly different from the Untreated Control (Water). The most effective treatment is the combination treatment of Euro FolVive MN ZN Liquid + Kanne Brottrunk, which is significantly reducing the plant damage compared to all other treatments.

All treatments were well tolerated by the plants and no crop tolerance problems were visible.

An attempt to interpret the significant differences of the treatments would be extremely difficult, as there may be direct effects (powdery mildew, mites, aphids) and indirect effects (stimulation of the plants, activation).

The conditions for enhancing powdery mildew could rather be achieved by doing the tests in a greenhouse, because in the grow rooms humidity management for powdery mildew conditions is not achievable as a great number of options were tested.

Once the greenhouses are established (plan late summer 2021), a repetition of the powdery mildew is proposed.

3. Summary and Conclusions

Strawberry plants were procured from Oekohum on 10 March 2021 with powdery mildew present on some plants, then put into various grow rooms and other rooms to enhance the disease.
On 12 April the treatment series was initiated as per protocol. During the testing phase powdery mildew did not progress, yet spider mites and aphids developed significantly and were controlled with a number of treatments.

Instead of powdery mildew evaluation, which was not possible, an overall damage assessment was conducted on 17 May. The damage assessment showed significant differences between the treatments. While all plants in the Untreated Control (Water) were dead, the combination treatment of Euro FolVive Mn Zn Liquid + Kanne Brottrunk at the lower dose rates showed the least damage with 30 %, also significantly less than all other treatments. Euro FolVive Mn ZN Liquid showed significantly less damage at both dose rates, while Kanne Brottrunk only at the lower dose rate.

All the treatments except Kanne Brottrunk at 10% reduced the damage significantly, which may be due to direct effects on the biotic factors (powdery mildew early, spider mites, aphids) or indirect effects (stimulation, activation of defenses).

08-Jun-21 M. Edriss / C. Lehnen

Appendix

Data

	Several factors (powdery mildew, mites, aphids)				
	17-05-21	Rep 1	Rep 2	Rep 3	Rep 4
Treatment	**Product**	% Severity	% Severity	% Severity	% Severity
1	Water	100%	100%	100%	100%
2	Euro FolVive Mn Zn Liquid 0.5 g/L	60%	70%	60%	70%
3	Euro FolVive Mn Zn Liquid 1g/L	60%	60%	70%	60%
4	Kanne Brottrunk spray 5%	50%	60%	100%	60%
5	Kanne Brottrunk spray 10%	100%	70%	100%	70%
6	Euro Volvive Mn Zn Liquid 0.5 g/L + Kanne Brottrunk spray 5%	50%	20%	30%	20%

Pictures

Fig. 2: UTC

Fig. 3: Euro Folvive 0.5g/L

Fig. 4: Euro Folvive 1g/L

Fig. 5: Kanne 5%

Fig. 6: Kanne 10%

Fig. 7: Euro FolVive + Kanne