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## *In vitro* and field evaluation of bio organics against powdery mildew of mango caused by *Oidium mangiferae* Berthet

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### Abstract

Fruit yield of mango can be drastically reduced or even lost due to infection of powdery mildew caused by *Oidium mangiferae*. It is widespread disease at the flowering stage of crop and even newly developed fruits drop down. Considering the endemic nature of disease under Konkan conditions the present investigation was carried out. In present study total six bio organics were tested against *Oidium mangiferae* in *in vitro* and in field conditions. All the tested bio organics significantly reduced the disease severity as compared to control. Among the six bio organics tested under *in vitro* and in field conditions Neem oil at 10% concentration showed significantly superior over rest of treatments with higher inhibition in conidial germination to the tune of 62.54 per cent in *In vitro* condition and reduced the disease severity (27.00%) as compared to control (60.33%) in field condition.

**Keywords:** Mango, Powdery mildew, *Oidium mangiferae*, Bio organics

### Introduction

Mango is the third widely produced fruit crop of the tropics after banana and citrus. Konkan is the major and famous mango producing belt on the west coast of Maharashtra where it occupies an area of 0.165 million ha in four districts viz., Thane, Raigad, Ratnagiri and Sindhudurg. The productivity of mango in Konkan is about 1.7 tonnes ha<sup>-1</sup>. Konkan region accounts for about 10 per cent of the total area under mango in the whole country out of which almost 90 per cent area is covered by the choicest mango cultivar 'Alphonso' which is locally called as 'Hapus' with a major export share to the tune of over 35 per cent. There are several diseases which do limit the successful cultivation, production, marketing and storage of fruits. Fruit yield of mango can be drastically reduced or even lost due to powdery mildew caused by *Oidium mangiferae* Berthet. It is widespread disease of panicles, blossom clusters, fruits and leaves. Rarely the disease development is also observed on new vegetative flush which emerges at the flowering stage under Konkan conditions. The disease can cause yield reduction up to 70 per cent due to its effects on fruit set and development [1-3]. If susceptible mango cultivars are grown in mildew-prone areas, growers should consider the probable damage due to powdery mildew infection which is going to occur in the earlier phase of fruit set. So that the probable loss can be minimized with optimum inputs. Continuous use of chemical fungicides in the management of powdery mildew disease on mango has led to new problems in addition to solving the existing problem. The chemical pesticides are causing serious problems and more alarming amongst them are pollution of air, water and soil, residual toxicity and development of resistance in the pathogen against chemical, thereby need to apply them frequently with their escalating prices and harmful effects on non-target organisms. Bio organics are ideal sources of low cost, eco-friendly and safe. Henceforth to achieve good yields, such mango growers should adopt timely control measures before it is too late to prevent the losses. In this view the research work was under taken at College of Agriculture, Dapoli. Different bio organics were imposed in *in vitro* and field conditions against powdery mildew.

### Material and methods

The details regarding materials used and methods followed during the present investigation have been presented here. The present investigation was carried out in the laboratory and in the field of college of agriculture, Dapoli during 2011-2012 and 2012-2013.

Six fungicides bio organics viz., Neem oil (10%), NSKE (10%), Marvel (0.2%), Cow urine (10%), Soap nut seed extract (10%) and Vavding seed extract (*Embelia ribes*) (10%) were evaluated under *in vitro* conditions by slide germination technique and in field condition against *O. mangiferae* Berthet.

**Spore germination studies:** Conidial germination assay was conducted using "Cavity Slide Technique". Required concentrations were prepared by dissolving known quantity of bio organics in sterile distilled water separately under aseptic conditions. prepared solution transferred aseptically to separate clean cavity slides at the rate of 0.1 ml per cavity, by using sterilized pipettes. Conidia from powdery mildew infected inflorescences were aseptically transferred to the cavity slides using separate sterile brushes. In each treatment, three replications were maintained. Slides were then incubated at a room temperature ( $27 \pm 2^\circ\text{C}$ ) under humid chamber. Observations on the spore germination were recorded at 18 and 24 hr. after incubation under microscope at 40X magnification and germination were recorded under 5 microscopic fields and the per cent conidial germination was calculated by using following formula.

$$PG = \frac{A}{B} \times 100$$

**Where,** PG = Per cent germination, A = Number of conidia germinated, B = Total number of conidia examined Also the per cent inhibition over control was calculated by using the formula given by Vincent <sup>[4]</sup>.

$$PI = \frac{C-T}{C} \times 100$$

**Where,** PI = Per cent inhibition. C = Number of spores germinated in control. T = Number of spores germinated in treatment. A field experiment was laid out in a Randomized Block Design with seven treatments and three replications for testing the efficacy of bio organics against *Oidium mangiferae*.

**Spray schedule for fungicides:** 1<sup>st</sup> spray: At the onset of the disease, and subsequent two sprays were given at seven days interval. Observations on intensity of disease was recorded using ten randomly selected inflorescences from each treatments and graded as per 0 to 5 scale given The per cent disease intensity (PDI) was calculated by using following formula.

$$PDI = \frac{\text{Sum of all numerical ratings}}{\text{No. of leaves examined} \times \text{Maximum Disease rating}} \times 100$$

The per cent disease reduction over control was calculated by using following formula.

$$PDR = \frac{\text{PDI in control} - \text{PDI in treatment}}{\text{PDI in control}} \times 100$$

## Results and discussion

*In vitro* evaluation: Total six bio organics viz., Neem oil (10%), NSKE (10%), Marvel (0.2%), Cow urine (10%), Soap nut seed extract (10%) and Vavding seed extract (10%) were tested under *invitro* conditions for testing their efficacy against the test fungus *O. mangiferae*. The observations on per cent conidial germination and per cent inhibition in conidial germination over control were recorded after 18 and 24 hrs. of incubation by using slide germination techniques. Data presented in table.1 revealed that during both the years Neem oil (10%) resulted in lowest per cent of conidial germination and highest per cent inhibition in conidial germination over control with 21.25 per cent and 62.54 per cent respectively. This was followed by Neem seed kernel extract (10%) and Marvel (0.2%) which showed 27.76 per cent and 32.36 per cent conidial germination and 51.05 and 42.95 per cent inhibition over control respectively. These results closely agree with the findings of, Joshi *et al.* <sup>[5]</sup> who found 91.21 per cent to 95.56 per cent reduction in conidial germination with Neemark and Nimbicidin respectively. Raghavendra <sup>[6]</sup> reported that NSKE (10%) showed least conidial germination (19.56%) of *Leveillula taurica*

**Table 1:** Per cent conidial germination and per cent inhibition in conidial germination over control in different bio organics treatments after 18 hrs. and 24 hrs. Of incubation

Tr. No.	Treatment details	Conc. (%)	After 18 hrs.		After 24 hrs.	
			Per cent Germination	Per cent Inhibition	Per cent Germination	Per cent Inhibition
T1	Neem oil	10	16.52 (23.97*)	64.26	21.25 (27.45)	62.54
T2	Neem seed kernel Extract	10	21.77 (27.81)	52.90	27.76 (31.79)	51.06
T3	Marvel	0.2	25.13 (30.07)	45.65	32.36 (34.66)	42.95
T4	Cow urine	10	35.45 (36.54)	23.32	42.73 (40.81)	24.68
T5	Soapnut Seed Extract	10	29.16 (32.68)	36.92	34.02 (35.68)	40.03
T6	Vavding Seed Extract	10	39.54 (38.96)	14.47	48.55 (44.17)	14.41
T7	Control		46.23 (42.84)		56.73 (48.87)	
SE.m±			0.47		0.83	
CD at 0.01%			1.45		2.57	

\* Values in parenthesis are arc-sin transformed values.

**Table 2:** Effect of bio organics on severity of powdery mildew of mango caused by *O. mangiferae*

Tr. No.	Treatment details	Conc. (%)	PDI				PDR
			before	After 1 <sup>st</sup>	After 2 <sup>nd</sup>	After 3 <sup>rd</sup>	
T1	Neem oil	10	9.67 (18.11)	13.00 (21.11)	23.00 (28.65)	27.00 (31.30)	55.24
T2	Neem seed kernel extract	10	12.00 (20.23)	15.67 (23.27)	25.33 (30.19)	31.00 (33.83)	48.61
T3	Marvel	0.2	12.00 (20.17)	17.00 (24.35)	26.67 (31.08)	35.00 (36.27)	41.98

T4	Cow urine	10	11.67 (19.90)	20.33 (26.79)	33.00 (35.05)	44.67 (41.94)	25.96
T5	Soapnut seed extract	10	11.33 (19.65)	19.00 (25.83)	30.00 (33.20)	39.00 (38.64)	35.35
T6	Vavding seed extract	10	10.67 (19.01)	25.33 (30.22)	34.67 (36.06)	56.00 (48.45)	7.18
T7	Control		11.00 (19.33)	28.00 (31.94)	39.00 (38.64)	60.33 (50.97)	
SE.m±			1.06	0.67	0.58	0.52	
CD at 0.05%			N.S.	2.06	1.78	1.61	

\* Values in parenthesis are arc-sin transformed values

**Field evaluation:** Field trials were conducted in randomized block design (RBD) with seven treatments and three replications during the years of 2011-12 and 2012-13. The powdery mildew severity was recorded one day before the first spray and 7 days after every spray using 0-5 scale. Data presented in table.2 revealed that all the bio organics were effective in reducing the powdery mildew severity except Vavding seed extract 10% (T6) which was found least effective with 53.33 per cent powdery mildew severity. During both the seasons of experimentation it was found that after 3rd spray there was 60.33 per cent disease severity untreated control which was the maximum. All the bio organics were found statistically superior over control. Neem oil 10% with 27.00 per cent disease severity and 55.24 per cent disease reduction over control was superior over all treatments. This was followed by Neem seed kernel extract 10%, Marvel (0.2%), Soap nut seed extract (10%) and Cow urine 10% (T4) showed 31.00, 35.00, 39.00 and 44.67 per cent disease severity and 48.61, 41.98, 35.35 and 25.96 per cent disease reduction over control respectively. Vavding seed extract (10%) was found least effective as compare to other treatments with 56.00 per cent disease severity and 7.18 per cent disease reduction over control. These results found closely in agreements with, Rajapakse *et al* [7] who reported that botanicals *viz.*, Neem seed extract, (0.5%) and Neem oil (0.3%) were found effective in controlling the powdery mildew of Rambutan (*Nephelium lappaceum* L.) caused by *Oidium nephelii*. Ravikumar [8] found that, neem based products *viz.*, Neemark (0.3%), Nimbicidin (0.3%) and Neem seed kernel extract (5%) were effective in controlling the powdery mildew of rose. Vijaya [9] stated that Neem seed kernel extract (5%) was found effective in controlling the powdery mildew of okra caused by *Erysiphe cichoracearum*.

### Summary and conclusions

Among six bio organics tested against *Oidium mangiferae* causing powdery mildew under *in vitro* conditions. Results revealed that Neem oil (10%) was efficient recording 21.25 per cent conidial germination with 62.54 per cent inhibition. This treatment was found to be the most promising treatment among the bio organics tested and followed by Neem seed kernel extract (10%), Marvel (0.2%) and Soap nut seed extract (10%) Cow urine (10%) was found comparatively less effective treatment. Whereas, effect of bio organics in reducing powdery mildew severity under field conditions revealed that among the bio organics sprays of Neem oil (10%) was found to be the best which recorded least powdery mildew severity of 27.00 per cent and 55.24 per cent disease reduction over control and significant over NSKE (10%) with 31.00 per cent powdery mildew severity and 48.61 per cent disease reduction over control

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