Entomology

European red mite, *Panonychus ulmi* (Koch) (Acari: Tetranychi-dae) and its management by using Horticulture mineral oils (HMOs) in apple orchards of Kashmir

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Abstract

The European red spider mite, *Panonychus ulmi*, is a major pest in almost all fruit growing regions of the world and affects the fruit production in Kashmir if not controlled early. The aim of the study was to find the effect of Bal spray oil Horticultural mineral oil (HMO) for its bio efficacy, phytotoxicity and effect on natural enemies against European red mite *Panonychus ulmi* (Koch) (Acari; Tetranychidae) on apple orchards variety red delicious at two locations in Kashmir during the year 2014 and 2015. Hindustan Petroleum (HMO) was used as standard check for conducting the experiment. Both the mineral oils were sprayed during dormant and summer seasons to suppress different stages of the pests. Different concentrations of oil were sprayed viz., 1.5, 2.0 and 2.5 % during dormant season. All the concentrations significantly reduced the insect pest populations over the standard check. The HMO Balspray resulted in highest mean mortality of (80.84%) at 2.5% followed by 77.46% mean mortality at 2.0% and at 1.0% concentration the molecule recorded mean mortality of (67.00%). Two parasitoids (*Amblyseius fallacis coccinellids)*, were found associated with the infested orchard with European red mite (ERM).

Keywords: life cycle, horticultural, *Panonychus ulmi*, mineral, oils and kashmir

Introduction

The European red spider mite, *Panonychus ulmi*, is a major pest in almost all fruit growing regions of the world (Hardman *et al*., 1985) [21]. Spread of *P. ulmi* to most apple-growing areas has probably been caused by the distribution of nursery stock carrying winter eggs. This mite is stated to be an important secondary pest (due to the effects of chemical sprays killing natural enemies) of commercial orchards throughout the United Kingdom (UK) and Europe (Cross and Berrie, 1994) [20] Apple is one of the most common crops in the world and also Kashmir. It has 147130 hectares under apple with 1995101 metric tons production. Although many arthropod pests and diseases cause economic losses on apple areas, Spider mite are one of the most important pests of apple production throughout the world. The European Red mite *Panonychus ulmi* Koch (Acari; Tetranychidae) is the most serious species of these spider mites in apple areas. It feeds on leaves results in mottling on the upper surface of leaves. Heavy infestations result in leaf bronzing and premature leaf fall may occur. Prolonged feeding by ERM can result in reduced fruit size, poor colour and may affect fruit set the following season. In many commercial apple orchards. the chemical applications are used for management of the European Red mite and other pest mites. The disruptive effects of these pesticides, especially due to development of resistance by pests, have led to greater reliance on natural enemies for their control in Canakkale region in apple orchards (Erol and Yasar, 1996; Atilihan *et al*, 2002) [18] Hence the present study to evaluate the effect of Horticulture mineral oils on dormant stages of ERM was imperative to find the organic solution to combat the resistance of mites against chemical miticides.

Material and methods

Field trials were laid out in two locations in Shelvat and Shadipora of district Bandipora. The apple trees were pruned during dormant season in the month of December During dormant season, Bal spray oil were sprayed at 1.5, 2.0, 2.5% concentrations along with standard check H.P oil at 1.5, 2.0, 2.5%, European red mite (*Panonychus ulmi*) infesting apple variety Red Delicious of 18-20 years old fruit trees at Shelwat & Shadipora (Bandipora) during 2020-21. The pesticide molecule were sprayed with the help of motorized sprayer and over wintered eggs/live ERM population were counted from the samples from each tree and egg/adult mite population was observed under binocular one day before application of pesticide spray and at subsequent intervals. Post count observations were also recorded. The experiment was laid in RBD with 7 treatments and 3 replications during dormant. Percent mortality was worked out by computing the difference between pre and post treatment population of the pest.

Adult stage of European red mite (ERM)

Eggs of ERM

Fig 1

Results and discussion

The European red mite overwinters in the egg stage. Hatching occurs in early spring, usually during the pink stage. The larva has two stages Protonymph and deutonymph. The newly hatched young immediately starts feeding on unfolding leaves by sucking out the juices from the leaves. Damage can be found in the form of spotting on leaves, and if severe infestations occur, the whole tree looks bronzed. The larvae go through two additional stages before becoming adults. The adult stage lasts for about 7 days (varies with temperature) in which time females lay on average 20 eggs. Egg development is uninterrupted and a new generation begins immediately. There are probably six to eight generations each year in Kashmir

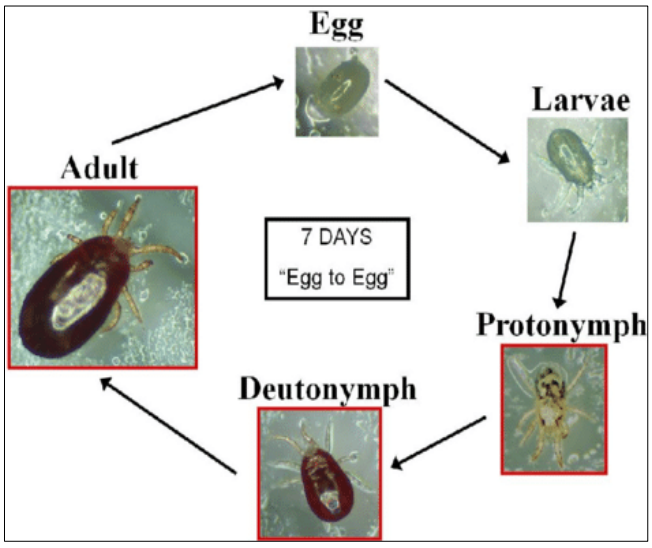


Fig 2

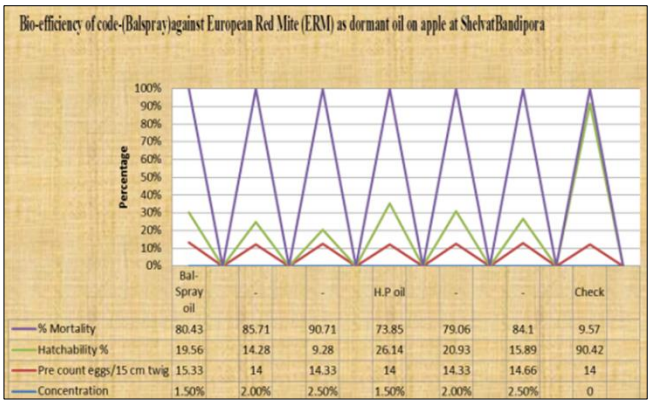
The fluctuations of European red mite population in sprayed and un sprayed plants of apple were conducted in Bandipora district of Kashmir. Bio-efficiency of Bal spray oil (HMO) besides standard check H.P and water as control were evaluated against ERM at Shelvat (Bandipora). At 2.5% resulted in highest mean mortality of (90.71%) followed by 85.71% mean mortality at 2.0% and at 1.0%concentration the molecule recorded mean mortality of (80.43%). All the treatments were statistically different from control which recorded 9.57% egg mortality during 2020 while as at 2.5% resulted in highest mean mortality of (80.84%) followed by 77.46% mean mortality at 2.0% and at 1.0% concentration the molecule recorded mean mortality of (67.00%). All the treatments were statistically different from control which recorded 8.14% egg mortality during 2021 (Table-1, fig 3). Bio-efficiency of Bal spray oil (HMO) besides standard check H.P and water as control were evaluated against ERM at Shadipora (Bandipora). At 2.5% resulted in highest mean mortality of (91.17%) followed by 87.90% mean mortality at 2.0% and at 1.0%concentration the molecule recorded mean mortality of (77.44%). All the treatments were statistically different from control which recorded 12.47% egg mortality during 2020 while as at 2.5% resulted in highest mean mortality of (80.32%) followed by 77.01% mean mortality at 2.0% and at 1.0% concentration the molecule recorded mean mortality of (62.46%). All the treatments were statistically different from control which recorded 5.69% egg mortality during 2021 (Table-1, fig 4).Two parasitoids (*Amblyseius fallacis coccinellids)*, were found associated with the infested orchard with European red mite (ERM).Perusal of data in Table-2 revealed that effect of Balspray at 2.5% concentration resulted in highest cumulative mean mortality (39.22%) of natural enemy complex followed by (30.36) at 2.0% concentration whereas least cumulative mean mortality of (27.29%) was recorded by at 1.0% concentration. While as standard check (H.P) at 2.5% conc. exhibited 48.83% cumulative mean mortality of European red mite (ERM) natural enemy complex. (Table-2).

Fig 3: Map of J and K India

Perusal of data in (Table-1) revealed that Bal spray 2.5% concentration recorded highest mean yield (13.83 boxes) of 'A' grade followed by 13.16 boxes at 2.0% concentration. The least number of 'A' grade (8.16 boxes) were recorded @ 1.5% concentration while in standard check (HP oil) @ 2.5% concentration yielded 13.33 boxes of 'A' grade. There was no phyto toxicity reported by using such HMOs. This study strongly suggests that HMO spray suppressed the mite population in the treated plants while as un sprayed plants resulted in an increase in *P. ulmi* These results are in agreement with Amano and Chant (1990) [2], Hardman *et al* (1997) [3], Van de vrie (1985) [17] and Yanar and Ecevit (2008) [19]. The study also suggest that Natural enemies play major role in suppression of ERM and are also vulnerable to pesticides.

Table 1: Bioefficacy of bal spray oil (HMO) against ERM (*Pananychus ulmi*) during dormant season on red delicious apple in Kashmir

Treatment	Concentration %	% Mortality of European red mite (ERM)/15 cm twig				Pooled Mean	Yield (A grade boxes)		Pooled Mean of yield
		2020		2021					
		Shelvat	Shadipora	Shelvat	Shadipora		2020	2021	
Bal-Spray oil (Dormant Oil)	1.5	80.43	77.44	67.00	62.46	69.38	8.00	8.33	8.16
	2.0	85.71	87.90	77.46	77.01	76.98	13.00	13.33	13.16
	2.5	90.71	91.17	80.84	80.32	79.93	13.33	14.33	13.83
H.P oil	1.5	73.85	77.83	72.06	75.76	72.66	8.00	8.00	8.00
	2.0	79.06	83.93	80.01	76.72	76.47	11.33	12.33	11.83
	2.5	84.10	91.42	80.01	77.22	78.20	13.66	13.00	13.33
Check	Water	9.57 (18.02)	12.47 (20.67)	8.14	5.69	5.16	4.33	3.33	3.83



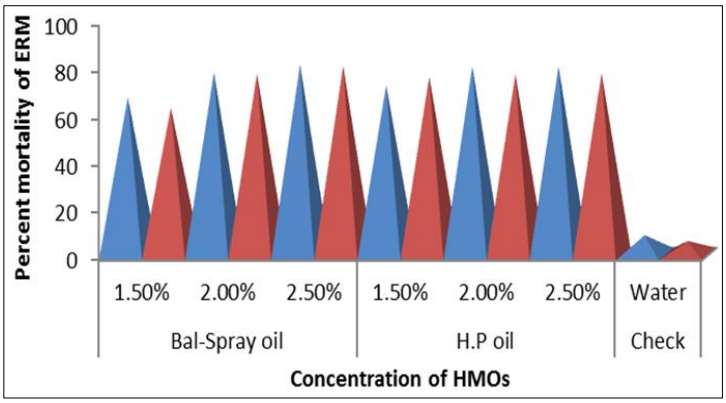


Fig 4: Effect of different HMOs on ERM in apple orchards of Kashmir

Table 2: Toxicity of HMOs against natural enemies of ERM (*Panonychus ulmi)* on apple cv. Red Delicious at Shadipora Bandipora

Treatments Code	Concentration%	Pre-treatment count of NEs/15cm twig		Pooled mean % mortality of NE		Cumulative Mean Mortality
		C	A	C	A	
Bal-Spray	1.5	2.33	3.66	27.29	25.99	27.29
	2.0	2.00	3.00	30.36	27.22	30.36
	2.5	2.66	3.00	39.22	33.44	39.22
H.p	1.5	2.00	3.66	29.41	36.33	29.41
	2.0	3.00	3.00	40.82	37.10	40.82
	2.5	2.33	3.33	48.83	50.04	48.83
Check	Water	2.33	3.00	0.00	0.00	0.00
C.D(P≤0.05)		0.13	0.12	1.09	1.67	

NE= Natural Enemy, A=*Amblyseius fallacis, C=coccinellids*

Conclusion

The results revealed significant differences in mean per cent mortality of the oil (Bal spray oil) used against target pests at different concentrations with respect to the untreated control. The oil caused significant reduction ERM populations at 2.5% followed by 2.0 % in dormant season.

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