



EFFICACY OF MINERAL OILS AGAINST SAN JOSE SCALE AND EUROPEAN RED MITE ON APPLE

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ABSTRACT

Field efficacy of horticulture mineral oil Rilso 999 and MAK All Season at different concentrations were evaluated at two locations i.e., Lar (District Ganderbal) and Hajin (District Bandipora) of J&K during 2017 and 2018, all the treatments were significantly superior in terms of mortality of San Jose scale *Quadraspidiotus perniciosus* (Comstock) (SJS) and European red mite (ERM) *Panonychus ulmi* (Koch) as compared to untreated control. The cumulative mean mortality of SJS (58.08% and 62.20%) and ERM (58.69% and 53.65%) at recommended dose of 7.5 ml/l of water both for standard check (MAK All Season) and Rilso999, respectively. Maximum (27.14 and 19.63 %) cumulative mortality of *Amblyseius* spp. and Coccinellids were recorded with Rilso999@ 10 ml/l of water, respectively. No phytotoxicity symptoms viz., leaf injury, yellowing, wilting, necrosis, hyponasty and epinasty were observed with Rilso999 at 15 ml/l of water. Maximum yield (246.16 kg/tree) was attained with MAK (standard check) @7.5 ml/l of water.

Key words: Rilso999, MAK All Season, HMO, apple, San Jose scale, European red mite, natural enemies, phytotoxicity, coccinellid, *Amblyseius*, yield

India is blessed with diverse agroclimatic conditions and has the potential to produce almost all kinds of fruits. Apples are grown along the foot hills of Himalaya, ranging from Shillong obtained with (Assam) to Darjeeling (Bengal), in Kumaon Hills of Uttar Pradesh, hills of Punjab, Kullu Valley and Simla in Himachal Pradesh and whole of Jammu and Kashmir. Jammu and Kashmir is the largest producer of apple, with a production of 1882774 mt (Directorate of Horticulture Kashmir, 2018). Many insect pests cause significant economic damage on apple. These pests cause losses both directly and indirectly. Among all these pests, San Jose scale and European red mite are the serious pests of apple trees in Jammu and Kashmir (Anonumous, 2014; Bhalla and Gupta, 1993; Mahendiran and Ganie, 2018). The San Jose scale *Quadraspidiotus perniciosus* (Comstock) nymphs and female adults suck the sap from branches, twigs and fruits, weakens the plant and leaves, render the fruit unacceptable and unmarketable. European red mite, *Panonychus ulmi* (Koch) is another serious pest feeding on foliage. Keeping in view the severity of these an experiment was undertaken to evaluate horticulture mineral oil i.e. Rilso 999 along with standard check -MAK against European red mite and San Jose scale in the apple ecosystem of Kashmir Valley.

MATERIALS AND METHODS

Rilso999 was evaluated during 2017 and 2018 under field conditions. The experiments were laid at two locations i.e. Lar (District Ganderbal) and Hajin (District Bandipora). There were five treatments-Rilso999@ 5.0, 7.5 and 10.0 ml/l of water, compared with MAK (standard check) @ 7.5 ml/l of water, with only water spray as control. Spraying was done by high volume sprayer @ 15 l/ tree. 12 branches/ tree were randomly selected for counting *Q. perniciosus*/ cm² area and for *P. ulmi* counting was from randomly selected 12 leaves/ tree. Coccinellids were counted from 4 branches/ tree and *Amblyseius* sp., was from 20 leaves/ tree. Pretreatment observations were recorded before spray and post treatment ones after 0, 1, 3, 5, 7, 14 and 21 days after spray; similarly it was followed for the coccinellids and *Amblyseius* spp. Phytotoxicity on leaf injury on tips/ surface, yellowing, wilting, necrosis, hyponasty and epinasty were observed with Rilso999@ 15ml/l of water after 1, 3, 5, 7 and 15 days after spray. Yield was computed as kg/tree at the time of harvest and compared.

RESULTS AND DISCUSSION

The results revealed that maximum mortality of

Table 1. Evaluation of mineral oils against *Q. perniciosus* and *P. ulmi* and their natural enemies in apple

Treatment	Dose (ml/l)	Mortality (%) of <i>Q. perniciosus</i>				Mortality (%) of <i>P. ulmi</i>				Cumulative mortality (%) of SJS	Cumulative mortality (%) of coccinellids	Cumulative Mean (%) mortality	
		2017		2018		2017		2018					
		Location 1 (Ganderbal)	Location 2 (Bandipora)	Location 1 (Ganderbal)	Location 2 (Bandipora)	Location 1 (Ganderbal)	Location 2 (Bandipora)	Location 1 (Ganderbal)	Location 2 (Bandipora)				
Rilso999	5.00	60.90	61.25	53.13	50.46	50.14	51.55	44.83	45.09	56.44	17.33	47.90	
	7.5	66.18	66.90	58.86	56.85	56.56	56.66	49.99	51.40	62.20	21.70	53.65	
MAK(Sd. Check)	10.0	69.90	70.18	60.10	58.46	57.90	58.90	51.86	53.87	64.66	27.14	55.63	
Water (Control)	7.5	73.14	73.65	63.83	61.69	61.90	61.98	54.47	56.39	68.08	20.72	58.69	
C.D (p≤0.05)	-	5.57	6.00	4.83	8.07	7.56	8.32	7.19	6.31	6.12	8.57	7.35	
SE (m)		7.75	7.75	6.91	6.04	6.20	6.16	5.52	5.84	-	-	-	
		2.34	2.34	2.09	1.82	1.87	1.86	1.67	1.76				
		Mortality (%) of <i>Amblyseius</i> spp											
Rilso999	5.00	17.74	17.29	16.36	17.95	8.25	6.96	7.07	7.33	17.33	7.40	7.40	
	7.5	21.41	22.03	23.18	20.18	15.65	14.32	13.43	16.44	21.70	14.96	14.96	
MAK(Sd. Check)	10.0	28.18	25.80	27.85	26.75	20.09	18.74	19.83	19.86	27.14	19.63	19.63	
Water (Control)	7.5	20.07	20.95	21.95	19.95	13.85	14.36	12.87	15.10	20.72	14.04	14.04	
CD (p≤0.05)	-	8.83	8.99	7.33	9.15	3.65	3.85	4.26	4.40	8.57	4.04	4.04	
SE (m)		1.97	1.79	2.22	1.79	1.81	1.71	1.71	1.83	-	-	-	
		0.59	0.54	0.67	0.54	0.55	0.52	0.52	0.55				
		Apple yield (kg) /tree											
		2017		2018		2017		2018		2017		2018	
		Location 1 (Ganderbal)	Location 2 (Bandipora)	Location 1 (Ganderbal)	Location 2 (Bandipora)	Location 1 (Ganderbal)	Location 2 (Bandipora)	Location 1 (Ganderbal)	Location 2 (Bandipora)	Location 1 (Ganderbal)	Location 2 (Bandipora)	Location 1 (Ganderbal)	Location 2 (Bandipora)
Rilso999	5.00	76.66	73.00	75.66	76.33	76.66	75.66	75.66	76.33	76.66	75.66	76.33	76.33
	7.5	242.33	241.66	247.66	249.66	242.33	241.66	247.66	249.66	242.33	241.66	247.66	249.66
MAK(Sd. Check)	10.0	216.66	217.00	220.33	223.66	216.66	217.00	220.33	223.66	216.66	217.00	220.33	223.66
Water (Control)	7.5	243.33	241.66	249.33	250.33	243.33	241.66	249.33	250.33	243.33	241.66	249.33	250.33
	-	53.00	54.33	54.00	52.00	53.00	54.33	54.00	52.00	53.00	54.33	54.00	52.00

Q. perniciosus (68.08%) was observed with the MAK (standard check) @ 7.5 ml/ l of water, followed by Rilso999 @ 10 and 7.5 ml/ l (64.66 and 62.20%, respectively. Maximum (58.69%) mortality of *P.ulmi* was observed again with MAK (standard check) followed by Rilso999@ 10 ml/ l (Table 1). Mir et al. (2015); Sherwani et al. (2017; 2018) and Bano et al. (2021) also observed that horticulture mineral oil (HMO) causes considerable reduction of both the pests. Maximum (27.14 and 19.63%) cumulative mortality of *Amblyseius* spp. and coccinellids were observed with Rilso999@ 10 ml/ l water, respectively; this was followed by Rilso999 and MAK @ 7.5 ml/ l of water. No phytotoxic symptoms were observed and maximum yield (246.16 kg/ tree) being obtained with MAK (standard check) followed by Rilso999.

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