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The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(10): 242-243

www.thepharmajournal.com
Received: 27-07-2022
Accepted: 30-08-2022

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Studies on impact of acaricides on the yield and quality of apple infested by European red mite *Panonychus ulmi* (Koch) in North Kashmir

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Abstract
The studies on impact of acaricides on the yield and quality of apple infested by European Red Mite *Panonychus ulmi* (Koch) in North Kashmir were carried out during 2017 at Pattan (Baramulla).Seven acaricides and one horticulture mineral oil were evaluated at a single concentration *viz.*, fenazaquin 10 EC @ 0.004, Propargite 57 EC @ 0.057, hexythiazox 5 EC @ 0.002, spiromesifen 240 EC @ 0.096, fenpyroximate 5 EC @ 0.005, ethion 50 EC @ 0.05, clothianidin 50 WDG @ 0.007, arbofine extra @ 0.75 and water as check against the pest infesting on apple trees during second week of July. The yield (A, B and C) grades was observed.The maximum yield of 'A' grade apples (9.44 boxes/tree) was recorded from trees sprayed with fenazaquin @0.004 percent at the rate of 70.24 percent.

Keywords: Apple, *Panonychus ulmi*, pesticides, HMO, yield

Introduction
Apple (*Malus* × *domestica* Borkh) belongs to the family Rosaceae which is believed to have been originated in temperate region of Western Asia between Black sea & Caspian sea and the major apple producing countries in the world are China, United States, Turkey, Poland, India, Italy, Brazil, Russia, France, Japan, Germany and USSR (Thumariakannan *et al*., 2010) [10]. The total area under this crop is 5920.35 thousand hectares with the annual production of 84637.24 thousand metric tones worldwide (FAO, 2014) [5]. In India the area under apple cultivation is 119 thousand hectares with the annual production of 2585 thousand metric tones (Anonymous, 2015) [2]. Jammu & Kashmir, Himachal Pradesh and Uttarakhand are the major apple producing states of India, but, Jammu and Kashmir leads both in acer age and production of apple with an area and annual production of 162.97 hectares and 1726.83 metric tones, respectively at the production rate of 10.60 metric tones per hectare (Anonymous, 2016) [3].
Foliar damage due to European red mite is mentioned as a possible reason for higher levels of fruit drop. The mite injury may cause pre mature fruit abscission prior to harvest (Hammer, 1943) [6]. The mites feed on plant sap and unless they are crowded they will mostly be found alongside the veins on the underside of the leaves (Blair and Groves, 1952) [4]. The mites injure the tree by feeding on leaves, reduces chlorophyll content, which turn brown and bronze in heavy infestation resulting in leaf fall and also causing fruit russetting (Anonymous, 1997) [1].

Material and Methods
To ascertain the overall effect of acaricides/HMO *viz.*, a *viz.*, yield parameter, the apple fruits were graded as A, B and C at the time of harvest.

Grades of apple	Size of apple fruit (mm)	Colour development (%)
A Super large	70 and above	>65
B Super medium	60-69	65
C Super small	<60	<65

Results and Discussion
The impact of acaricides on the yield and quality of apple infested by European red mite
The results of acaricides/ HMO on yield and quality of apple infested by ERM indicated a significant increase in number of boxes for apple yield of grade (A) ranging from 4.55 to 9.44 as compared to 2.33 to 3.33 and 1.67 to 3.21 in apple grades of (B) and (C), respectively by

application of different treatments. Amongst all the pesticides used fenazaquin exhibited maximum 9.44 boxes/tree followed by spiromesifen, ethion and hexythiazox which yielded 8.55, 7.22 and 7.12 apple grade (A) boxes, respectively. These findings do find favour with the earlier records of Pandey *et al.*, 2014 [9] who also reported maximum production of 8.35 and 7.99 apple boxes/tree by use of fenazaquin during 2010-2011, respectively. Similarly, highest fruit yield of 147.5 Kg/tree was recorded in fenazaquin (Mohapatra *et al.*, 2012). However, Pandey and Tripathi (2014) [8] recorded higher yield (190.0 and 202 kg/tree) with higher dosage of abamectin (1.2 ml /l) followed by its lower dosage 0.6 ml/l resulting in fruit yield (197.33 and 181.6 kg/tree) during two consecutive years.

Table 1: Effect of various pesticides on yield and quality of Red Delicious cv. Of apple infested with European Red Mite (*Panonychus ulmi* Koch) at Pattan (Baramulla) 2017

Name of Acaricides/HMO	Conc. (%)	Yield of A, B and C Grade Apples (Boxes/Tree)						Total
		A	% (A)	B	% (B)	C	% (C)	
Fenazaquin 10 EC	0.004	9.44 (3.23)	70.24	2.33 (1.82)	17.34	1.67 (1.63)	12.43	13.44
Propargite 57 EC	0.057	5.60 (2.57)	46.67	3.28 (2.08)	27.33	3.12 (2.03)	26.00	12.00
Hexythiazox 5 EC	0.002	7.12 (2.85)	57.79	2.52 (1.87)	20.45	2.68 (1.92)	21.75	12.32
Spiromesifen 240 SC	0.096	8.55 (3.09)	64.98	2.44 (1.85)	18.54	2.17 (1.78)	16.49	13.16
Fenpyroximate 5 EC	0.005	6.58 (2.75)	53.93	2.98 (1.99)	24.43	2.64 (1.91)	21.64	12.20
Ethion 50 EC	0.05	7.22 (2.87)	56.98	3.22 (2.05)	25.41	2.23 (1.79)	17.60	12.67
Clothianidin50 WDG	0.007	5.52 (2.55)	50.83	3.22 (2.05)	29.65	2.12 (1.76)	19.52	10.86
Arbofine extra (HMO)	0.75	4.55 (2.35)	41.03	3.33 (2.08)	30.03	3.21 (2.05)	28.94	11.09
Control (Water spray)	-	1.52 (1.58)	14.93	3.51 (2.12)	34.48	5.15 (2.48)	50.58	10.18
SE(m)		0.003		0.002		0.002		
C.D. ($p \leq 0.05$)		0.010		0.005		0.005		

Each figure is a mean of three replications
Figure in parenthesis indicates square root transformed values

Conclusion

Maximum yield of 'A' grade apples (9.44 boxes/tree) was recorded in trees sprayed with fenzaquin 10 EC @0.004 percent.

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