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Evaluation plant originated insecticides against aphid, *Macrosiphoniella sanborni*

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Abstract
At the Collage Agronomy farm of the Bansilal Amritlal College of Agriculture, Anand Agricultural University, Anand, a field experiment was carried out to examine the bio-efficacy of plant leaf extracts against the aphid, *Macrosiphoniella sanborni*. To protect the chrysanthemum crop from aphids, neem seed kernel suspension (NSKS) at 5%, tobacco decoction at 2%, and neem leaf extract (NLE) at 10% all performed better. The 10% leaf extracts of Ardusa, Naffatia, Karenj, and Jatropha were shown to be ineffective against this pest. The highest yield of flowers was produced by the crude NSKS extract (17.73 t/ha), followed by the tobacco decoction (15.70) and the neem leaf extract (12.90). Tobacco decoction and Neem leaf extracts with yields of 61.30, 58.38, and 53.04% may be prevented, respectively, with the spray application of NSKS. On the other hand, 10% leaf extracts of Naffatia, Karenj, Jatropha, and Ardusa recorded 5.02 to 9.2 t/ha of chrysanthemum flower production, of which 30.96 to 45.17% flower output may be avoided.

Keywords: Chrysanthemum, botanical extracts, aphid, and *Macrosiphoniella sanborni*

Introduction
A major commercial flower crop cultivated in Gujarat is the chrysanthemum (*Chrysanthemum coronarium* Linnaeus), which occupies roughly 4600 hectares of land and yields 24,420 MT of flowers annually. This flower crop is mostly produced in Anand, Vadodara, Navsari, Surat, and Valsad (840 MT of chrysanthemum flowers; Dhaduk, 2004) [5]. The aphid, *Macrosiphoniella sanborni*, is a significant pest that attacks chrysanthemums and causes significant losses because its constant eating stunts plant development and sometimes causes the death of whole plants (Bhattacharjee and De, 2003) [2]. Chrysanthemum virus B and chrysanthemum vein mottle virus were also spread by aphids (Chan *et al*., 1991) [4]. Due to their eco-friendliness, natural botanical materials and their derivatives are now regarded as key components in pest control. There is little information available on using botanical pesticides to control this pest. The current research on the aphid, M. sanborni, which infests chrysanthemums was carried out with these viewpoints in mind.

Materials and Methods
Seven different botanical substances, including *Azadirachta indica* A. Juss's 5% and 10%, *Ipomoea fistulosa* Mart. ex Choisy's 10%, *Pongomia glabra* Vent.'s 10%, *Jatropha gossypifolia* Linn.'s 10%, *Alianthus excelsa* Roxb.'s 10%, and *Nicotiana tabaccum* Linnaeus's 2%, were tested against M. At the college agronomy farm, B. A. College of Agriculture, AAU, Anand, the crop was transplanted at 45 x 45 cm in Randomized Block Design with three replications in plots of 4.5 1.8 m over the winter. The necessary number of leaves or seeds from the appropriate botanical treatments were ground in a grinder to create the leaf extract.
One kilogram of tobacco leaf dust was soaked overnight in ten liters of water to make tobacco decoction. Boiling at a temperature of 60 to 70 degrees Celsius for one hour, adding more water to make a volume of 10 liters, and filtering with muslin cloth. 200 g of washing soap was added to this stock solution and well mixed. One part of the stock solution and five parts of clean water were combined to create the spray solution.
Using a manually powered knapsack sprayer with a duromist nozzle on chrysanthemum, the first spray application was made as soon as the pests first appeared, and three further sprays were applied at intervals of 10 days after that. Before the first spray and 1, 3, 5, 7 and 10 days following each spray application, the population of aphids on 15 cm long terminal twigs of five randomly chosen plants was noted. When ready to harvest, the flowers were taken from each replication of the treatment and weighed. For each treatment, the total weight of flowers in tons per acre was determined after three pickings. ANOVA was used to analyze the data collected on different factors.

Results and Discussion

Based on aphid populations that have been accumulated over time and via sprays, the efficacy of different treatments has been determined. Table 1 shows the information on the aphid population pooled over time after each spray as well as pooled over time. After the first spray, the results showed without a doubt that all of the treatments substantially varied from the control. Neem seed kernel suspension (NSKS) was shown to be much better than the other plant/botanical treatments, with the exception of tobacco decoction, and it also had the lowest aphid population (13.49/15 cm twig). Since there were no discernible distinctions between them, neem leaf extract was determined to be just as effective as tobacco decoction. Leaf extracts from Jatropha, Naffatia, and Karenj were comparable to one another. The Ardusa leaf extract recorded considerably the greatest (35.62) aphid population across several botanicals/plant material leaf extracts and was shown to be the least effective botanical therapy.

After the second spray, the aphid population was much lower in all botanicals/plant materials (11.89 to 28.77 par 15 cm twig) than in the untreated control (50.05) (Table-1, Column-3). With the exception of tobacco decoction, which was on par with NSKS, NSKS retained its dominance and reported the lowest (11.89 per 15 cm twigs) aphid population of all the botanicals. As effective as tobacco decoction was shown to be neem leaf extract. The other botanical compounds were all comparable in their ability to reduce the aphid population (26.54 to 28.77).

After the third spray, all botanical treatments reported a considerably reduced aphid population (14.94 to 33.26 per 15 cm twig) than the control (52.94) (Table 1, Column 4). NSKS was determined to be much better than the other botanicals and had the lowest population (14.94) among them. Neem leaf extract and tobacco decoction were both successful and did not substantially vary from one another. The remaining botanical/plant extracts showed to be similarly efficient with no noticeable variations.

Additionally, information on the aphid population was combined throughout time and sprayed, and it is shown in Table 1, Column 5. Each botanical treatment dramatically reduced the number of aphids compared to the control. Tobacco decoction and neem leaf extract were shown to be the next most effective botanical treatments for lowering the aphid population, with NSKS recording considerably the lowest population (13.41 per 15 cm twig) of all the treatments. Since these treatments were statistically comparable to one another, the leaf extracts of Naffatia, Jatropha, Karenj, and Ardusa were shown to be more or less similarly effective. Overall, NSKS 5% and tobacco decoction 2% were more successful in treating chrysanthemums with aphid infestations.The statistics on chrysanthemum flower production shown in Table 2 (Column 2) made it abundantly evident that plots treated with all botanical/plant materials produced much more flowers (16.20 to 28.92 tonnes/ha) than the control (11.19). The plots treated with NSKS and tobacco decoction had the maximum floral yields. The second method maintained parity with Neem leaf extract. Furthermore, compared to the other botanical treatments, the NSKS, tobacco decoction, and Neem leaf extract showed greater flower yields. Jatropha (19.73), Naffatia (19.84), and Karenj (20.41) leaf extracts yielded almost the same amount of flower output. The least productive botanical, Ardusa leaf extract had the fewest flowers produced (16.21), making it the least efficient. The calculation and presentation of avoidable losses in floral production (in tonnes/ha and percentage) are shown in Table 2 (Columns 3 and 4). According to avoidable loss, the treatments were administered in the following chronological order: NSKS (17.73 tones/ha and 61.30%); tobacco decoction (15.70 and 58.38); neem leaf extract (12.90 and 53.04); karenj leaf extract (9.2 and 45.1); naffatia leaf extract (8.65 and 43.59); jatropha leaf extract (8.65 and 43.58); and ardusa leaf extract (5. The application of NSKS at 5%, followed by tobacco decoction at 2%, and Neem leaf extract at 10%, might prevent the maximum yield loss. Due to the lowest yield loss, ardusa leaf extract turned out to be the least effective. The treatments Neem Seed Kernel Suspension (NSKS) @ 5%, tobacco decoction @ 2%, and Neem Leaf Extract (NLE) @ 10% were shown to be efficient in lowering the aphid population among the numerous indigenous plant materials examined against them. Opender (1999) [7] revealed that the spray application of crude extract of NSK @ 5% maintained decreased aphid (*M. sanborni*) population in chrysanthemum, providing significant evidence for the superiority of NSKS in the current experiment. The increased efficiency of NSKS against the safflower-infesting aphid, *Uroleucon compositae*, was also noted by Mallapur *et al*., 2001 [6], and Anon., 2006 [1]. The increased efficiency of Neem leaf extract at 10% against the *Uroleucon compositae* infesting gaillardia crop at Anand was also highlighted by Bhatt (2005) [3]. As a result, the current results closely match the previous studies. Naffatia, Karenj, Jatropha, and Ardusa leaf extract applied at a concentration of 10% was shown to be less successful in defending the chrysanthemum crop against *M. sanborni*. Since there is no information on these botanicals' efficacy against this pest in published literature, the current study cannot be compared to prior studies.

Table 1: Effectiveness of various botanicals on population of aphid, *M. sanborni*

Treatments (%)	No. of aphids /15 cm twig at indicated period			
	Pooled over 5 periods after indicated spray			Pooled over periods & sprays
	First	Second	Third	
1	2	3	4	5
NSKS 5% (*Azadirachta indica* A. Juss)	3.74 a	3.52 a	3.93 a	3.73 a
	(13.49)	(11.89)	(14.94)	(13.41)
Neem leaf extract 10% (*Azadirachta indica* A. Juss)	4.30 b	4.33 b	4.88 b	4.50 b
	(17.99)	(18.25)	(23.31)	(19.75)
Naffatia leaf extract 10% (*Ipomoea fistulosa* Mart. ex Choisy)	5.49 c	5.25 c	5.65 c	5.46 c
	(29.64)	(27.06)	(31.42)	(29.31)
Karenj leaf extract 10% (*Pongomia glabra* Vent.)	5.53 c	5.37 c	5.81 c	5.57 c
	(30.08)	(28.34)	(33.26)	(30.52)
Jatropha leaf extract 10% (*Jatropha gossypifolia* Linn.)	5.44 d	5.41 c	5.74 c	5.53 c
	(29.09)	(28.77)	(32.45)	(30.08)
Ardusa leaf extract 10% (*Alianthus excelsa* Roxb)	6.01 d	5.20 c	5.56 c	5.59 c
	(35.62)	(26.54)	(30.41)	(30.75)
Tobacco decoction 2 % (*Nicotiana tabaccum* Linn.)	4.06 ab	4.01 ab	4.70 b	4.26 b
	(15.98)	(15.58)	(21.59)	(17.65)
Control	7.48 e	7.11 d	7.31 d	7.30 d
	(55.45)	(50.05)	(52.94)	(52.79)
Mean	5.26	5.03	5.45	5.24
	(27.13)	(24.75)	(29.17)	(26.96)
S. Em. ±: Treatment (T)	0.13	0.19	0.22	0.11
Period (P)	0.12	0.13	0.14	0.11
Spray (S)	-	-	-	0.07
T x P	0.35	0.37	0.39	0.21
T x S	-	-	-	0.18
P x S	-	-	-	0.13
T x P x S	-	-	-	0.37
C. D. at 5%: T	0.39	0.58	0.66	0.30
P	0.35	0.37	0.39	0.36
S	-	-	-	0.18
T x P	0.98	NS	NS	NS
T x S	-	-	-	NS
P x S	-	-	-	0.36
T x P x S	-	-	-	NS
C.V. %	11.52	12.64	12.43	12.21

Notes:
1. NS: Non significant
2. Figures in parentheses are retransformed values; those outside are √(X+0.5) value
3.Treatment mean with letter in common are not significant at 5 % level of significance within a column

Table 2: Effectiveness of various botanicals on chrysanthemum flower yield and avoidable losses due to aphid, *M. sanborni*

Treatments	Yield of flower tones/ha	Avoidable losses	
		Tones/ha	Percentage
1	2	3	4
NSKS 5%	28.92 a	17.73	61.30
Neem leaf extract 10%	24.09 b	12.90	53.54
Naffatia leaf extract 10%	19.84 c	8.65	43.59
Karenj leaf extract 10%	20.41 c	9.22	45.17
Jatropha leaf extract 10%	19.73 c	8.54	43.28
Ardusa leaf extract 10%	16.21 d	5.02	30.96
Tobacco decoction 2 %	26.89 ab	15.70	58.38
Control	11.19 e	-	-
Mean	20.91	-	-
S. Em. ± :	1.14	-	-
C. D. at 5%	3.44	-	-
C. V.%	9.41	-	-

Notes
1. Treatment mean with letter in common are not significant at 5 % level of significance within a column
2. Avoidable loss (Tonnes/ha) = Yield of treatment – Yield of control

$$3.\ \text{Avoidable loss (\%)} = \frac{\text{Yield of treatment} - \text{Yield of control}}{\text{Yield of treatment}} \times 100$$

Conclusion

In the nut shell, plant originated insecticides used in early stage can be found effective to lower the initial population build up of sucking pests. This will also be helpful in reducing the plant protection costs. Initial spray of botanicals will also be helpful to maintain the population of natural enemies which in combination with other tactics can be found economical to delay the spray of synthetic chemicals and ultimately the cost of production.

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