been in conformity with the results obtained by Neeman et al., (1993) in the seeds of *Pinus cistus* and annuals.

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Bioefficiency of Nimbecidine and TNAU neem on cowpea aphid *Aphis craccivora* (Koch) applied to fieldbean

A. ANNIE BRIGHT AND A. REGUPATHY
Tamil Nadu Agricultural University, Coimbatore - 641 003.

Abstract : Two field trails were conducated at Tamil Nadu Agricultural University (TNAU), Coimbatore during 1996-97 to evaluate the effectiveness of Nimbecidine 0.03% EC and TNAU Neem 0.03% EC in comparision with methyl demeton against the field bean aphid *Aphis craccivora* Koch. The mean per cent reduction of *A. craccivora* field population, by the neem formulaions was to the extent of 50.2-96.0, 43.4-89.1, 11.2-67.2 and 1.0-28.1 per cent on 1,3,7 and 14 DAT (Days after treatment) respectively when compared to 95.6-99.7, 91.2-97.2, 74.6-87.5 and 51.9-63.4 per cent by methyl demeton at 1,3,7 and 14 DAT. Both the neem formulations were comparable in their efficacy. The effectiveness of the formulations increased with increase in dose from 200 ml to 1000 ml/ha and decreased as the days advanced. The order of efficacy was Methyl demeton 25 EC>Nimbecidine 0.03 EC=TNAU Neem 0.03 EC. *(Key Words : Fieldbean, Aphis craccivora, Neem products, Bioefficacy*

The Cowpea aphid, *Aphis craccivora* Koch is one of the major pests of field bean (*Lablab purpureus var typicus* L. Sweet.). It causes enormous damage to almost all the plant parts *viz.* leaves, inflorescence and pods. Although synthetic chemical insecticides remain indispensable in reducing pest damage, they constitute a high economic and health risk to poor farmers with few resources. Therefore in recent years, considerable efforts are being made worldwide to find safer biodegradable substitutes. The most important of them is the neem *Azadiracha indica* A. Juss, known for its legendary insecticidal properties and safety to environment. The chances of insert pests developing resistance to neem derivatives are remote (Schmutterer, 1990). These virtues make them ideal pesticides. The present investigation therefore was undertkaen to study the effectiveness of two neem formulations *viz.* Nimbecidine 0.03% EC and TNAU Neem 0.03% EC against field bean aphid.

Materials and Methods

The bioefficacy of the neem formulations was evaluated in two field trails conducted during 1996-97 in the eastern block of Tamil Nadu Agricultural University Farm, Coimbatore. Both the experiments were laid out in a randomised block

design with three replications and ten treatments, as given in the table. Methyl demeton was used as the recommended standard insecticide. The plot in which no insecticidal spraying was carried out was taken as the untreated check.

The seeds of lablab were sown at a spacing of 45 x 30 cm. The plot size maintained was 20m² (5 x 4 m). The recommended dose of fertilizers *viz* 25:0:0 Kg/ha as basal and 25:0:0 Kg/ha as top dressing 40 DAS (days after sowing) was applied uniformly to all experimental plots. A pre-emergence herbicide pendimethalin (Stomp 30 EC) was applied at the rate of 0.75 Kg/ha on one DAS and subsequently three handweedings were done.

Application of the neem formulation as well as the standard insecticide methyl demeton was made 30, 45, 60 and 75 DAS. The quantity of spray fluid used was 1000 l/ha. Spraying was done with a hand operated knapsack sprayer.

For assessing the population of aphids, the method described by Hanifa et al (1973) was followed. Since the aphids colonise mostly the terminal shoots, the population of both nymphs and adults of aphids was assessed in 2.5 cm length of terminal shoot in each of the ten randomly selected plants per plot. Observations were taken before and 1, 3, 7 and 14 days after each application. The percent reduction of aphid population over control was calculated as per Henderson and Tilton (1955). In the RBD analysis, the data expressed in terms of percentage in different experiments were converted to arcsine percentage values. Analysis of variance was done and the mean values of treatments were separated by using Duncan's Multiple Range Test (Gomez and Gomez, 1984).

Results and Discussion

The population of aphids before the first application was in the range of 325-623 numbers per 10 plants for the first trial and 87-307 for the second trial. The reduction due to the first application of the neem formulations on 1 DAT was to the extent of 62.4-96 per cent in the first trial and 57.1-91.4 per cent in the second trial. The reduction percentage increased with increase in dosage with both the neem formulations. The effect was less as the days advanced. The mean reduction on 14 DAT even at the highest dose of neem formulation was only 25.6-28.1 per cent and 22.7-24.2 per cent during the first and second trials respectively and at lower doses, the reduction on 14 DAT was less than 5 per cent. In both the trials, methyl demeton effected the maximum reduction, the reduction on days 1, 3, 7 and 14 after application being 99.7, 95.9, 83.2 and 63.4 per cent in the first trial and 97.8, 93.2, 83.3 and 51.9 per cent in the second trial.

The reduction effected by the neem formulations after the second application ranged from 61.7-91.7 per cent at 1 DAT during the first trial whereas for the second trial, the reduction varied between 56.8-92.1 per cent at 1 DAT. At 14 DAT, the reduction was 1.2 - 28.1 per cent and 4.1 - 21.7 per cent respectively for the first and second trials. As in the case of first application, methyl demeton effected the maximum reduction in both the trials.

The third application of the neem formulations brought about 70.7 to 91.2 per cent and 51.3 to 94.2 per cent on 1 DAT in the first and second trials respectively. The per cent reduction decreased to 3.2 - 25.5 and 4.7 - 24.4 during 14 DAT respectively for the first and second trials.

Similarly, the fourth application of the neem pesticides effected a reduction of 63.0 to 90.5 per cent in the first trial and 50.2 to 85.2 in the second trial on 1 DAT. At 14 DAT the per cent reduction was 3.3 - 21.7 and 6.5 - 23.6 respectively for the first and second trials.

Both the neem formulations were comparable in their bioefficacy. The efficiency increased with dosage. At the lower dosage significant reduction was seen upto seven days after application. The maximum reduction (>84 percent) was observed at the highest concentration on 1 DAT. The order of toxicity was methyl demeton 25% EC > Nimbecidine 0.03% EC = TNAU Neem 0.03% EC.

Thus, it is concluded that higher dose of neem formulations showed promising results in controlling damage by aphids and are comparable in their efficacy with the chemical insecticide. The effectiveness of methyl demeton against aphids is in confirmity with the studies made by Khurana and Kaushik (1991).

The reduction of aphid population might be due to contact toxicity as well as antifeedant effect. Neem contains a diverse array of biological active principles such as azadiractin, salanin and meliantriol of which the most important is azadiractin, a tetra or triterpenoid which is very potent. It has antifeeding, antiovipositional, growth disrupting, fecundity reducing and sterility causing effects on different insects. The effectiveness of the neem formulations against a wide array of pests is attributed to these properties. Thus, neem based products which are pest effective, ecofriendly and

Table 1. Effect of First and Second Applications of Nimbecidine 0.03% EC and TNAU Neem 0.03% EC on *A. craccivora* - Trail I

Sl. No.	Treament	Dose ml/ha (gai/ ha)	Population Before First Application*	Percent reduction - 1st application 32 DAS				Population Before Second Application*	Percent reduction - 2nd application 47 DAS			
				1 DAT	3 DAT	7 DAT	14 DAT		1 DAT	3 DAT	7 DAT	14 DAT
1.	Nimbecidine .03 EC	200 (0.06)	569	69.7 (56.6)de	59.7 (50.6)e	20.7 (20.7)e	1.2 (6.4)e	694	65.1 (53.8)e	51.5 (45.9)d	28.2 (45.9)d	1.2 (6.0)e
2..	Nimbecidine .03 EC	400 (0.12)	438	77.3 (61.6)cd	63.9 (53.1)de	38.3 (38.3)cd	3.9 (11.4)de	553	70.6 (57.2)de	58.7 (50.0)d	36.2 (37.0)cd	4.0 (14.5) e
3.	Nimbecidine .03 EC	500 (0.15)	519	88.8 (70.5)bc	76.6 (61.1)cd	52.1 (46.2)bc	8.3 (16.7)cd	595	81.8 (64.8)cd	73.6 (59.1)bc	46.1 (42.8)cd	13.6 (21.7)c
4.	Nimbecidine .03 EC	1000 (0.30)	623	94.5 (76.4)b	89.0 (70.7)ab	57.3 (49.2)b	25.6 (30.4)b	603	91.7 (73.2)b	82.9 (65.6)b	55.0 (47.8)b	28.1 (31.3)b
5.	TNAU Neem .03 EC	200 (0.06)	394	62.4 (52.9)de	59.5 (50.5)c	11.2 (19.6)e	2.8 (907)de	499	61.7 (51.8)e	54.0 (47.3)d	26.6 (31.0)d	1.0 (5.6)e
6.	TNAU Neem .03 EC	400 (0.12)	516	77.7 (61.6)bcd	62.0 (51.9)e	34.9 (51.9)e	2.9 (10.2)de	653	72.9 (58.7)dc	61.6 (51.7)cd	32.6 (34..8)d	7.5 (15.9)cd
7.	TNAU Neem .03 EC	500 (0.15)	406	84.6 (66.9)c	77.1 (61.4)cd	46.0 (42.7)bc	13.3 (21.4)c	456	80.6 (63.8)	71.3 (57.6)c	39.2 (38.8)cd	13.8 (21.8)c
8.	TNAU Neem .03 EC	1000 (0.30)	325	96.0 (78.4)b	87.6 (69.4)b	57.5 (49.3)b	28.1 (32.0)b	308	88.4 (70.1)bc	82.3 (70.1)bc	54.1 (47.3)b	25.2 (30.2)b
9.	Methyldemeton25 EC	1000 (250)	419	99.7 (86.6)a	95.9 (78.3)a	83.2 (65.8)a	63.4 (52.8)a	199	98.1 (82.0)a	95.4 (77.6)a	78.1 (62.1)a	60.1 (50.8)a
10.	Untreated Check	-	610	-	-	-	-	791	-	-	-	-

* Aphid population per 10 plantsDAS - Days after sowing; DAT - Days after treatment Figures in parentheses are Arc Sin √p; where p in is corrected percent reduction. Means followed by the same letters in a colomn are not significantly different by DMRT

Table 2. Effect of Third and Fourth Applications of Nimbecidine 0.03% EC and TNAU Neem 0.03% EC on *A. craccivora* - Trial I

Sl. No.	Treament	Dose ml/ha (gai/ ha)	Population Before Third Application*	Percent reduction - 3rd application 62 DAS				Population Before Fourth Application*	Percent reduction - 4th application 76 DAS			
				1 DAT	3 DAT	7 DAT	14 DAT		1 DAT	3 DAT	7 DAT	14 DAT
1.	Nimbecidine .03 EC	200 (0.06)	871	71.4 (57.7)e	57.2 (49.1)f	28.8 (32.5)c	5.5 (13.6)d	796	63.0 (52.5)d	50.3 (45.2)e	37.7 (37.9)cd	3.3 (10.4)e
2.	Nimbecidine .03 EC	400 (0.12)	638	79.6 (61.1)cde	66.0 (54.3)def	36.5 (37.1)de	9.1 (17.6)cd	562	67.3 (55.1)d	68.2 (55.5)d	40.7 (39.7)cd	7.7 (16.1)de
3.	Nimbecidine .03 EC	500 (0.15)	672	87.8 (69.6)bc	79.6 (63.2)bc	43.1 (41.0)cd	17.4 (24.6)bc	535	81.9 (64.8)c	72.8 (58.5)cd	46.5 (43.0)c	11.8 (20.1)cd
4.	Nimbecidine .03 EC	1000 (0.30)	453	91.2 (78.8)b	84.5 (66.8)b	54.8 (47.8)bc	25.5 (30.3)b	328	90.5 (72.1)b	82.4 (65.2)b	58.8 (50.1)b	21.7 (27.8)b
5.	TNAU Neem .03 EC	200 (0.06)	646	70.7 (57.3)e	59.7 (50.6)ef	25.0 (30.0)e	3.2 (10.2)d	600	65.6 (54.1)d	51.7 (46.0)e	33.7 (35.7)d	4.3 (12.0)c
6.	TNAU Neem .03 EC	400 (0.12)	723	77.4 (61.6)de	70.8 (57.3)cde	33.5 (35.3)de	8.4 (16.8)d	643	70.2 (59.9)d	64.8 (53.6)d	40.8 (39.7)cd	11.0 (19.4)cd
7.	TNAU Neem .03 EC	500 (0.15)	475	85.1 (67.3)bcd	75.4 (60.3)bcd	42.3 (40.6)d	17.4 (24.7)bc	380	81.4 (64.4)c	70.7 (57.2)d	45.7 (42.5)c	17.9 (25.0)bc
8.	TNAU Neem .03 EC	1000 (0.30)	271	88.6 (70.3)bc	82.6 (65.3)b	56.7 (48.9)b	24.2 (29.5)b	199	88.2 (69.9)bc	81.1 (64.2)bc	58.4 (49.8)b	20.8 (27.1)b
9.	Methyldemeton25 EC	1000 (250)	97	97.0 (80.1)a	97.2 (80.3)a	87.5 (69.3)a	53.8 (47.2)a	43	97.6 (81.1)a	91.2 (75.7)a	82.3 (65.1)a	57.3 (49.2)a
10.	Untreated Check	-	964	-	-	-	-	940	-	-	-	-

* Aphid population per 10 plantsDAS - Days after sowing; DAT - Days after treatment Figures in parentheses are Arc Sin √p; where p in is corrected percent reduction. Means followed by the same letters in a colomn are not significantly different by DMRT

Table 3. Effect of First and Second Applications of Nimbecidine 0.03% EC and TNAU Neem 0.03% EC on *A. craccivora* - Trial II

Sl. No.	Treament	Dose ml/ha (gai/ ha)	Population Before First Application*	Percent reduction - 1st application 30 DAS				Population Before Second Application*	Percent reduction - 2nd application 46 DAS			
				1 DAT	3 DAT	7 DAT	14 DAT		1 DAT	3 DAT	7 DAT	14 DAT
1.	Nimbecidine .03 EC	200 (0.06)	187	57.1 (14.1)e	50.0 (45.0)f	29.0 (32.5)d	4.1 (9.9)e	291	59.1 (50.3)e	50.3 (45.2)e	29.0 (32.5)d	3.3 (10.4)e
2..	Nimbecidine .03 EC	400 (0.12)	126	63.5 (52.9)cde	59.6 (50.6)def	36.1 (36.9)cd	8.8 (14.1)de	190	65.5 (54.1)dc	68.2 (55.5)d	36.1 (36.9)cd	7.7 (16.1)de
3.	Nimbecidine .03 EC	500 (0.15)	269	74.1 (59.4)c	71.7 (57.9)cd	43.2 (41.1)c	12.8 (20.8)cd	378	74.1 (59.5)cd	72.8 (58.5)cd	43.2 (41.1)c	11.8 (20.1)cd
4.	Nimbecidine .03 EC	1000 (0.30)	87	91.4 (73.6)b	88.4 (70.7)ab	67.2 (55.1)b	24.2 (30.0)b	106	91.4 (73.4)b	87.3 (69.4)b	55.4 (48.1)b	21.7 (27.7)b
5.	TNAU Neem .03 EC	200 (0.06)	307	57.6 (49.4)dc	55.1 (47.9)	27.2 (31.3)d	3.4 (8.3)e	512	56.8 (48.9)e	52.4 (46.4)e	26.6 (31.0)e	4.1 (9.8)d
6.	TNAU Neem .03 EC	400 (0.12)	174	63.6 (52.9)cde	61.8 (51.9)def	34.6 (36.0)cd	7.9 (13.7)be	260	66.4 (54.6)cde	60.7 (51.2)de	31.8 (34.3)de	11.9 (20.1)c
7.	TNAU Neem .03 EC	500 (0.15)	183	71.3 (57.6)cd	65.8 (54.2)de	38.9 (38.6)cd	13.0 (21.1)cd	254	75.7 (60.5)c	71.6 (57.8)c	42.8 (40.9)c	15.8 (23.0)bc
8.	TNAU Neem .03 EC	1000 (0.30)	154	89.5 (71.2)b	82.5 (65.3)bc	61.4 (51.6)b	22.7 (28.4)bc	194	92.1 (74.0)b	89.1 (70.7)ab	53.5 (47.0)b	20.8 (27.1)b
9.	Methyldemeton25 EC	1000 (250)	170	97.8 (83.3)a	93.2 (75.2)a	83.3 (66.0)a	51.9 (46.1)a	124	97.6 (82.8)a	93.7 (75.6)a	75.3 (60.3)a	53.7 (47.1)a
10.	Untreated Check	-	183	-	-	-	-	295	-	-	-	-

* Aphid population per 10 plantsDAS - Days after sowing; DAT - Days after treatment Figures in parentheses are Arc Sin $\sqrt{p}$; where p in is corrected percent reduction. Means followed by the same letters in a colomn are not significantly different by DMRT

Table 4. Effect of Third and Fourth Applications of Nimbecidine 0.03% EC and TNAU Neem 0.03% EC on *A. craccivora* Koch - Trial II

Sl. No.	Treament	Dose ml/ha (gai/ ha)	Population Before Third Applica-tion*	Percent reduction - 3rd application 61 DAS				Population Before Fourth Application*	Percent reduction - 4th application 80 DAS			
				1 DAT	3 DAT	7 DAT	14 DAT		1 DAT	3 DAT	7 DAT	14 DAT
1.	Nimbecidine .03 EC	200 (0.06)	315	52.9 (46.16)d	43.4 (41.2)d	28.9 (32.5)d	5.8 (3.6)cd	320	52.5 (46.4)fg	46.5 (43.0)d	28.2 (32.1)d	6.5 (13.9)e
2.	Nimbecidine .03 EC	400 (0.12)	187	63.9 (53.1)c	50.7 (45.4)d	35.7 (36.7)cd	9.9 (18.2)de	179	62.9 (52.5)de	52.2 (46.2)d	36.7 (37.3)cd	12.7 (20.7)cd
3.	Nimbecidine .03 EC	500 (0.15)	360	70.5 (57.2)c	67.0 (55.0)c	40.5 (39.5)c	14.5 (22.2)d	333	72.1 (58.1)cd	68.4 (55.8)d	43.7 (41.4)bc	19.1 (26.0)bc
4.	Nimbecidine .03 EC	1000 (0.30)	92	92.6 (74.7)b	80.3 (63.8)b	51.2 (45.7)b	24.4 (29.5)b	73	84.3 (66.7)b	79.3 (63.0)c	50.6 (45.4)b	23.5 (29.0)b
5.	TNAU Neem .03 EC	200 (0.06)	547	51.3 (45.7)d	44.2 (41.7)d	26.3 (30.9)d	4.7 (10.6)f	550	50.2 (45.1)g	50.0 (45.0)d	27.5 (31.6)d	7.3 (15.3)de
6.	TNAU Neem .03 EC	400 (0.12)	253	63.8 (53.1)c	51.4 (45.8)d	32.6 (36.0)cd	10.2 (13.7)be	244	61.6 (51.7)ef	51.8 (46.0)d	36.3 (37.1)cd	14.1 (21.9)c
7.	TNAU Neem .03 EC	500 (0.15)	242	70.9 (57.4)c	63.5 (52.8)c	41.9 (34.8)cd	16.0 (18.6)de	224	75.0 (60.1)c	68.9 (56.2)c	37.3 (37.6)cd	17.5 (24.7)bc
8.	TNAU Neem .03 EC	1000 (0.30)	171	94.2 (76.4)b	82.1 (65.0)b	51.3 (40.3)bc	23.3 (23.3)bc	134	85.2 (67.5)b	80.1 (63.6)b	51.6 (45.9)b	23.6 (29.1)b
9.	Methyldemeton25 EC	1000 (250)	64	97.2 (82.4)a	91.2 (73.0)a	74.6 (59.8)a	52.2 (46.2)a	33	95.6 (80.1)a	92.8 (77.3)a	77.0 (61.4)a	59.6 (50.5)a
10.	Untreated Check	-	326	-	-	-	-	346	-	-	-	-

* Aphid population per 10 plantsDAS - Days after sowing; DAT - Days after treatment Figures in parentheses are Arc Sin p; where √p in is corrected percent reduction. Means followed by the same letters in a colomn are not significantly different by DMRT

less costly can be advocated to be ideal components of integrated pest management system.

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Ready to use dry mix for Idli

K. SINGARAVADIVEL

Paddy Processing Research Centre, Thanjavur - 613 005, Tamil Nadu, India.

Abstract : A ready to use dry mix with parboiled rice flour and blackgram flour was prepared and its fermentation was augmented with curd or fermented batter - an external source of inoculum. Idlies prepared from that batter after 9-13 h ferementation was organoleptically equal to that of regular wet ground method. For this dry mix method, rice flour vs blackgram flour, dry mix vs water ratio and optimum time of fermentation were standardised. *(**Key Words** :Dry mix Idli, Wet ground, Curd, Fermented batter)*

The breakfast dish prepared out of milled rice is idli in Indian households and it requires stone grinding of soaked parboiled milled rice and blackgram dhal separately into pastes, mixing them together and fermenting for 16-18 h before steam cooking (Desikachar et al. 1960). This takes lot of time and in modern times, when most of the housewives also leave for jobs early, an instant Idli mix is the need to prepare Idli. Although attempts have been made in the past to prepare instant idli mixes, the quality of Idli made out of them was not comparable to that made from stone ground and fermented batter idli. Moreover, instant idli mixes available in the market are mostly non-fermented product and in it chemicals are added to get softness of the idli. Therefore, in the present study, possibilities were explored to develop a product of rice flour and blackgram flour that could be used readily for fermentation with external inocula to prepare idli.

Materials and Methods

Parboiled milled rice (variety IR 20) was finely ground in flour mill (plate grinder) and sieved through -22 +30 BSS and decuticled dry blackgram dhal also was powdered and sieved through -50 BSS mesh. Two parts of rice flour, one part of blackgram dhal flour and 2 per cent sodium chloride were mixed together (dry mix) and stored. To identify the best source of external inoculum to ferment dry mix, different sources of inoculum, viz., bread yeast (5 mg), active dry yeast (5 mg), fermented idli batter (¼ spoon), toddy (5 ml) - a fermented product of the sugary exudates of inflorescence of palmyrah *(Borassus flabellifer L.)* or coconut *(Cocus nucifera L.)* and curd (¼ spoon) separately as well as each one mixed with curd were tried.

The batter was prepared from the dry mix stock by uniformly dispersing 100 g of dry mix in 200 ml water into a homogenous consistency. To that mixture, different sources of inoculum in different combinations as mentioned in Table 1 were added and kept in one glass beaker. The raise in batter volume, pH and flavour were observed after