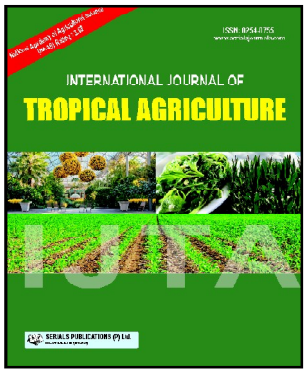

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Impact Evaluation of Cow-Urine and Vermiwash on Insect Pests of Brinjal

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Abstract: A field experiment was conducted at Agronomy Farm, B. A. College of Agriculture, Anand Agricultural University, Anand (Gujarat) to assess the impact of cow-urine and vermiwash against insect pests of brinjal during *kharif-rabi* seasons of the year 2010-11 and 2011-12. The treatments of cow-urine (CU) alone at 20, 30, 40 and 50%, cow-urine fortified at 20% with different leaf extract *i.e.* neem leaf extract (NLE), custard apple leaf extract (CLE), jatropha leaf extract (JLE) and *Lantana camara* leaf extract (LLE), vermiwash at 25%, vermiwash at 25% + cow-urine at 25% and NSKE 5% along with untreated control. The results concluded that cow-urine at 20% fortified with leaf extract of either neem, custard apple, jatropha or lantana at 10% suppressed the sucking pests (aphid, leaf hopper and whitefly) as well as shoot and fruit borer. The plots treated with cow-urine 20% fortified with neem leaf extract 10% produced maximum (287.89 q/ha) fruit yield followed by cow-urine 20% fortified with jatrophoa leaf extract 10% (268.56 q/ha), cow-urine at 50 (263.06 q/ha) and 20% fortified with custard apple leaf extract 10% (256.68 q/ha).

Key words: Cow-urine, vermiwash, brinjal, insect pests.

INTRODUCTION

Brinjal (*Solanum melongena* Linnaeus) is considered as a "King of vegetables" originated from India where a wide range of wild types and land races occur (Thompson and Kelly, 1957) and is now grown as a vegetable throughout the tropical, sub-tropical and warm temperate areas of the world. In Gujarat, the total area under brinjal is about 0.76 lakh hectares with annual production of 14.77 lakh metric tonnes (Anonymous, 2015).

Brinjal crop is subjected to attack by a number of insect-pests right from nursery stage till harvesting

which affects crop cultivation and acts as a limiting factor in the profitable cultivation. Butani and Verma (1976) listed 36 insects, whereas Nayar *et al.* (1995) recorded 53 insects attacking on brinjal. Of which shoot and fruit borer, *Leucinodes orbonalis* Guenee; jassid, *Amrasca biguttula biguttula* (Ishida); whitefly, *Bemisia tabaci* Gennadius; aphid, *Aphis gossypii* Glover and non-insect pests like mites especially two spotted spider mite, *Tetranychus urticae* Koch are the main bottle necks in brinjal productivity (Rizvi, 1996). Chemical insecticides are used as the frontline defence sources against insect pests. However, their indiscriminate and continuous used creates a number of undesirable problems.

Recently, the use of animal byproducts such as cow-urine, buttermilk and vermiwash for insect pest suppression is gaining importance. Its use on crops delay the resistance to pests and increases the overall crop yield due to immuno-stimulant activity. These products are ecofriendly in nature and gaining importance in organic farming systems. Effectiveness of cow urine against cabbage and bhendi aphid, pest complex of pigeonpea, soyabean leaf folder and flea beetle has been reported in literature. Vermiwash diluted with water (1:1 ratio) or diluted with 10% cow urine proved an effective biocide and can be exploited for kitchen garden. It helps in reducing the load of toxic pesticides and chemical fertilizers in agriculture. So far, Gujarat state is concerned, no data base information is available on the use of cow-urine and vermiwash on insect pests, their arthropod natural enemies and yield attributing characters. Therefore, the present study was carried out to insight the knowledge on this aspect.

MATERIALS AND METHODS

Field experiment was conducted during *kharif-rabi* seasons of 2010-11 and 2011-12 to assess the impact of cow-urine and vermiwash against insect pests of brinjal in a Randomized Block Design (RBD) at Agronomy farm, B. A. College of Agriculture, Anand Agricultural University, Anand (Gujarat). For the purpose, brinjal variety Anand Brinjal Hybrid-1 (ABH-1) was transplanted in a plot of 4.8 m × 4.5 m with a spacing of 90 cm × 60 cm with standard agronomical package of practices recommended for the state, except plant protection. There were total twelve treatments replicated three times. The treatments included cow-urine (CU) alone at 20, 30, 40 and 50%, cow-urine 20% fortified with neem leaf extract (NLE), custard apple leaf extract (CLE), jatropha leaf extract (JLE) and *Lantana camara* leaf extract (LLE), vermiwash at 25%, vermiwash at 25% + cow-urine at 25% and NSKE 5% along with untreated control. The respective treatments of bio-pesticides were sprayed on brinjal crop by manually operated knapsack sprayer with hollow cone nozzle. Considering the activity of different pests, two sprays were given during the crop period.

The treatments of cow-urine and vermiwash were evaluated against insect pests of brinjal. For the purpose, incidence of sucking pests *viz*., aphid, leafhopper and whitefly was recorded prior and 3, 7 and 10 days after each spray whereas incidence of shoot and fruit borer (*L. orbonalis*) was recorded by counting the total and infested shoots on 5 randomly selected plants from net plot area. Similarly, the damage due to fruit borer was also assessed by counting the total and borer damaged fruits harvested during each picking. Yield of marketable fruits was weighed separately for each treatment. Thus, the data obtained for sucking pest population were analyzed by standard statistical procedure (Steel and Torrie, 1980) after adopting square root transformation and damage due to shoot and fruit borer was analyzed by using arc sine transformation, whereas, the yield data were analyzed without any transformation.

RESULTS

Data on mean aphid population of aphid, *A. gossypii* (Table 1) worked out for two sprays indicated that the plots treated with cow-urine 20% + neem leaf

Table 1
Impact of different treatments of cow–urine and vermiwash on incidence of pest complex infesting brinjal

		Mean number/leaf*			*Damage (%) by L. orbonalis*							
Sr. No.	*Treatments*	*Aphid*	*leaf hopper*	*Whitefly*	*Shoot damage*	*Fruit damage*	*Fruit yield (q/ha)*	*Increase in yield over control (Kg/ha)*	*Gross income (Rs/ha)*	*Cost of treatment (Rs/ha)*	*Net realization (Rs/ha)*	*ICBR*
1.	Cow urine 20%	2.26e*** (4.61)	2.30f (4.79)	2.08f (3.83)	23.32f** (15.67)	29.62k (24.43)	239.87bc	4173	41730	800	40930	1:51.16
2.	Cow urine 30%	2.18de (4.25)	2.23def (4.47)	2.02def (3.58)	22.60ef (14.77)	27.60i (21.46)	239.20bc	4106	41060	1000	40060	1:40.06
3.	Cow urine 40%	2.16de (4.17)	2.19def (4.30)	1.96def (3.34)	22.20ef (14.28)	26.98h (20.58)	252.47bc	5433	54330	1200	53130	1:44.28
4.	Cow urine 50%	2.17de (4.21)	2.18def (4.25)	1.92cdef (3.19)	21.59def (13.54)	23.40e (15.77)	263.06abc	6492	64920	1400	63520	1:45.37
5.	Cow urine 20% + NLE 10%	1.75a (2.56)	1.76a (2.60)	1.65a (2.22)	17.06a (8.61)	18.09a (9.64)	287.89a	8975	89750	1000	88750	1:88.75
6.	Cow urine 20% + CLE 10%	1.90abc (3.11)	1.96bc (3.34)	1.75ab (2.56)	19.44bc (11.08)	19.09b (10.70)	256.68abc	5854	58540	1000	57540	1:57.54
7.	Cow urine 20% + JLE 10%	1.80ab (2.74)	1.85ab (2.92)	1.70a (2.39)	18.42ab (9.98)	21.01d (12.85)	268.56ab	7042	70420	1000	69420	1:69.42
8.	Cow urine 20% + LLE 10%	1.86abc (2.96)	1.93abc (3.22)	1.79abc (2.70)	19.77bcd (11.44)	20.19c (11.91)	251.19bc	5305	53050	1000	52050	1:52.05
9.	Vermiwash 25%	2.25e (4.56)	2.26ef (4.61)	2.04ef (3.66)	23.45f (15.84)	24.99f (17.85)	235.69c	3755	37550	5400	32150	1:5.95
10.	Vermiwash 25% + cow urine 25%	1.96bc (3.34)	2.04bcd (3.66)	1.87bcd (3.00)	20.78cde (12.59)	25.61g (18.68)	241.55bc	4341	43410	5950	37460	1:6.30
11.	NSKE 5%	2.02cd (3.58)	2.10cde (3.91)	1.88bcde (3.03)	20.90cde (12.73)	28.47j (22.72)	238.69d	4055	40550	650	39900	1:61.38
12.	Untreated control	2.71f (6.84)	2.59g (6.21)	2.44g (5.45)	28.23g (22.37)	31.95l (28.00)	198.14	–	–	–	–	–
	S. Em.± T	0.06	0.07	0.06	0.69	0.07	–	–	–	–	–	–
	C.D. at 5% T	0.18	0.19	0.16	1.95	0.19	–	–	–	–	–	–
	C. V.%	14.55	12.27	13.54	15.14	12.27	–	–	–	–	–	–

NLE – Neem Leaf Extract, CLE – Custard apple Leaf Extract, JLE – Jatropha Leaf Extract, LLE – Lantana Leaf Extract

*Mean of two sprays **Arc sin transformed values, Figures in parentheses are retransformed values; ***Figures are $\sqrt{x} + 0.5$ transformed values whereas those in parentheses are retransformed values

extract 10% registered minimum (2.56 aphids/ leaf) population of aphids followed by CU 20% + JLE 10% (2.74), CU 20% + LLE 10% (2.96) and CU 20% + CLE 10% (3.11). Former two treatments of cow-urine fortified at 20% + different leaf extracts differed significantly from CU sprayed alone (20 to 50%). Vermiwash applied at 25% concentration proved least effective against aphids but the combine application of vermiwash (25%) + CU (25%) found better and proved equally effective to that of the NSKE (5%).

Data on leaf hopper, *A. biguttula biguttula* population worked out for two sprays revealed that among the various concentrations of cow urine fortified at 20% + different leaf extracts, CU 20% + NLE 10% registered minimum (2.60 hoppers/ leaf) population of hoppers followed by CU 20% + JLE 10% (2.92) and CU 20% + LLE 10% (3.22), whereas, CU applied alone proved relatively less effective against leafhopper. With respect to leafhopper population, the treatment of vermiwash (25%) + CU (25%) differed significantly from the treatment of vermiwash applied alone.

Mean number of whitefly, *B. tabaci* calculated based on two sprays indicated that all the treated plots registered significantly low incidence of the pest in comparison to untreated control. Minimum (2.22 whiteflies/ leaf) population of whitefly was recorded in CU 20% + NLE 10% followed by CU 20% + JLE 10% (2.39), CU 20% + CLE 10% (2.56) and CU 20% + LLE 10% (2.70). These treatments differed significantly from rest of the treatments, except vermiwash + CU and NSKE. With respect to whitefly population, all the treatments of CU applied alone at different concentrations (20 to 50%) found at par.

The plots treated with CU 20% + NLE 10% registered significantly lowest (8.61%) percentage of damaged shoots than the rest of treatments except CU 20% + JLE 10% (9.98%) which remained at par with it. The treatment of CU 20% + CLE 10% and CU 20% + LLE 10% also proved effective against shoot and fruit borer. With respect to shoot damage, these treatments were at par with vermiwash + CU, NSKE and CU applied at highest (50%) concentration.

Significantly least (9.64%) percentage of damaged fruits due to shoot and fruit borer were registered in plots treated with CU 20% + NLE 10%. The treatment of CU 20% + CLE 10% also found effective and stood next to aforesaid treatment against shoot and fruit borer. CU sprayed alone at higher (50%) concentration found mediocre in its effectiveness. Among the different treatments evaluated, CU alone sprayed at lower (20%) concentration and NSKE (5%) proved inferior in controlling the shoot and fruit borer.The higher fruit yield was registered in plots treated with CU (20%) fortified with plant leaf extract (10%) over rest of the treatments. The plots received with sprays of CU (20%) + NLE (10%) produced maximum (287.89 q/ha) yield followed by CU + JLE (268.56 q/ha), CU 50% (263.06 q/ha) and CU + CLE (256.68 q/ha).

ECONOMICS

Economics (Table 1) of different treatments calculated based on the fruit yield data, its prevailing market price and cost of treatments, it revealed that maximum net realization with ICBR was found in the treatment of CU (20%) fortified with NLE followed by CU + JLE and CU+CLE. Though the treatment of NSKE showed higher (1:61.38) ICBR value, it failed to prove its superiority over other treatments evaluated in present study.

CONCLUSION

From the above results, it can be concluded that the sucking pests as well as shoot and fruit borer incidence in brinjal crop found to be suppressed and consequently obtained the higher yields from the plots treated with cow urine fortified at 20% + neem

leaf extract 10%, jatropha leaf extract 10% and custard apple leaf extract 10%. None of the earlier worker has evaluated the impact of cow urine and vermiwash against insect pests of brinjal. However, few workers have tested its impact against insect pests other than brinjal crop and documented their potential against various pests. Reduction in insect population on different crops by using cow urine has been reported by Purwar and Yadav (2003), Chilana and Ram (2010), Gupta (2005), Mishra *et al.* (2007) and Ahirwar *et al.* (2010). All these reports are in accordance with the above findings.

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