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Efficacy of vantex 60 CS, blanket 150 SC, and, dynamo 1.15% wp on cotton bollworms

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ABSTRACT

Production of cotton is faced with a number of challenges and amongst these are a lot of pests including aphids, mealybugs, and bollworms. Cotton bollworms namely heliothis, red, spiny, and pink can cause a yield reduction of 67 percent if they are not properly controlled. A study to evaluate the efficacy of Vantex 60 CS, Dynamo 1.15% WP and Blanket 150 SC, new insecticides intended for use in cotton was carried out at CRI, Tokwane and Matikwa in 2020 – 21 and 2021-22 seasons. Vantex 60 CS levels were 50ml, 100ml and 150ml. Dynamo 1.15% was tested at 1250g, 2500g and 3000g. Blanket 150 SC levels were 125ml, 250ml and 300ml. Decis Forte rate was 50ml/ha. There was a no control treatment. Bollworm counts and predator counts were measured. Data analysis was done using Genstat 14th Edition. Data that did not follow the normal distribution was transformed using the square root transformation of (x + 3/8). Means were separated using Duncan's Multiple Range Test in ascending order.Vantex at 150ml/ha, Blanket at both 250ml/ha and 300ml/ha were comparable to Decis Forte for Red, Heliothis and spiny bollworms as well as predator preservation. Dynamo was comparable to Decis Forte in preserving predators at all its levels as shown by Matikwa for both seasons but was outcompeted by Decis Forte in Heliothis bollworm control. Its 2500g and 3000g/ha were comparable to Decis Forte for RBWL and spiny bollworm control.

Keywords: Blanket, Vantex, Dynamo, bollworm, species, efficacy, predator, ascending, data, cotton.

INTRODUCTION: Cotton is a crop that is affected by pests in different groups such as leaf-eaters, sucking pests and the bollworms. While all these require management, the bollworm needs thorough attention as it affects almost all parts of the plant. This includes the boll which is most economic part as it is the bolls that constitute yield. The methods that can be used to control these cotton pests are numerous and include biological control, IPM, crop rotation as well as the use of synthetic pesticides. The red bollworm (*Diparopsis watersi*), African bollworm (*Herlicoverpa armigera*), the pink bollworm (*Pectnoptera gossypiella*) and the spiny bollworm (*Earisinsulana*) make up the major bollworm complex of cotton in sub-saharan Africa (Renou and Deguine, 1992). They are among the most serious bollworm species that affect the cotton plant (Badii and Asante. 2011). The cotton bollworm caterpillar tends to be resistant to a number of insecticides and therefore compromise on control (Grains and Research Corporation, 2011). Of all the above-mentioned bollworms, pink bollworm is controlled by a closed season because of the difficulty in control due to its feeding habit and damage. Its larva feeds on the stems, flowers, flower buds bolls and seeds and bores a tunnel which encircles the stem by destroying the cambium as it feeds (Bulletin of Entomological Research, 2009). The spiny bollworm attacks cotton from leaf bud formation to maturity, damaging flower buds and acorns (Qader and Saber, 2021). This project was mainly focusing on the use of insecticides as a control method. These pesticides were being tested for their efficacy in bollworm control at different levels. Why the new chemicals are being tested is in order to boost the ones that are already available on the market. At the same time some of these available ones are losing their worthiness and therefore need replacement. This replacement can only be done after thorough tests and investigations into the new ones have been carried out. Management of the bollworm is based on scouting for eggs or small larva (Michaud, 2013).

OBJECTIVE: (a)To determine the efficacy of Vantex 60CS, Blanket 150SC and Dynamo 1.15%WP insecticides on cotton bollworms. (b) To observe the effect of Vantex 60CS, Blanket 150SC and Dynamo 1.15%WP on predators of cotton bollworms.

MATERIAL AND METHODS: Trials were established at Cotton Research Institute, Tokwane, Matikwa and Dande. The experiment comprised of eleven treatments including the no chemical control (table 1). Decis Forte was the standard.

Treatment	Treatment Level
1. No control	0
2.Decis Forte	50ml/ha
3.Vantex 60 CS	50ml/ha
4.Vantex 60 CS	100ml/ha
5.Vantex 60 CS	150ml/ha
6.Dynamo 1.15% WP	1250g/ha
7.Dynamo 1.15% WP	2500g/ha
8.Dynamo 1.15% WP	3000g/ha
9.Blanket 150 SC	125ml/ha
10.Blanket 150 SC	250ml/ha
11.Blanket 150 SC	300ml/ha

Table 1: Treatments of the study.

Experimental design: The experiments were laid down using Randomised Complete Block Design (RCBD) with 11 treatments replicated 4 times. Plot sizes were 8 rows x 10metres = 80m^2.Sprayed area was 6 rows x 8 metres = 48m^{2}while the sampling area was 4 rows x 6 metres = 24m^2. The treatments used in this experiment are as shown in the table 1above:

Measurements: Bollworm larva, predators and bollworm eggs, were recorded during scouting.

Data analysis: Data was analysed using Genstat 14th edition andBollworm larval counts were transformed using the square of x + $^3/_8$. **Data collection:** Six plants were scouted per plot and 24 plants per treatment. The scouting process was done by

inspecting the whole plant, counting and recording the score of the bollworm eggs and larva as is indicated by table two below. Scouting was done twice in a week, first to determine the bollworm eggs or larval thresholds, and secondly to determine the efficacy of the sprayed chemicals. The bollworm eggs or their larva were determined by their natural occurrence and not by inoculations. The six plants that were scouted were randomly selected within the sampling area. These selected plants were tagged and are the once that were used again in the second scouting for efficacy testing. Tagging together with random selection of plants to use in data collection (scouting) was done to reduce the scout's bias towards plants with certain physiological features. Tagging was also done to identify the sampled plants in the proceeding scouting operations and use untagged ones. This would give all plants within the sampling area an equal chance of being used in data collection. The bollworm larva counts were recorded after scouting using the scoring system as shown in table 2 below. During scouting of tagged plants predator counting was done two days after spraying to also determine the impact of the sprayed pesticides on the predators (table 2).

Pest	When to spray
Heliothis Bollworm eggs	Eggs ≥ 12 on 24 scouted plants per treatment
Red Bollworm Eggs	Eggs ≥ 6 on 24 scouted plants per treatment
Spiny Bollworm larva	Larva ≥ 6 on 24 plants per treatment

Table 2: Bollworm thresholds for determining timing of insecticide sprays.

RESULTS AND DISCUSSION: Significant differences were noted among treatments for Red and Heliothis bollworms at Tokwane, Matikwa and Dande in 2020/21 season of P <.001, except for RBWL which had a p-value 0f 0.004 for Dande while there were no significant differences for RBWL at Tokwane. Vantex at 150ml and Blanket at 250ml and 300ml/ha were comparable to Decis Forte in the two seasons at those sites with results showing significant differences as shown by both tables 3 and 4. However, the standard treatment (Decis Forte) controlled the bollworms better than all the levels of Dynamo 15%WP except at Matikwa and Dande where it was comparable and better respectively especially for RBWL control in 2020-21 season. For both seasons, Dynamo at 2500g and 3000g was comparable to Decis Forte on RBWL control (table 3 to 7). Vantex at 150ml and Blanket at 300ml were comparable to the standard while at Matikwa, Blanket at 300ml outperformed the standard treatment.

Effect of treatments on spiny bollworm Larva in 2020-21 and 2021-22 Seasons: There were significant differences for spiny bollworm control at CRI, Matikwa and Dande. Vantex at 150ml/ha, Dynamo at 2500g and 3000g/ha was comparable to Decis Forte at Matikwa and Dande for spiny bollworm control. Blanket at 250ml and 300ml were similar to Decis Forte.

Effect of treatments on predators at CRI, Tokwane and Matikwa in 2020-21 season: There were significant differences among treatment means for the predators shown in table 6.1 and 6.2. CRI, Dande and Matikwa recorded some predators for 2020-21 season while only Matikwa showed significant differences for predators in 2021-22 season. Vantex, Dynamo and Blanket were comparable or outperformed the standard Decis Forte in the preservation of predators except for spiders at Matikwa where there were similarities in both the standard and treatment effects.

TRTS	CRI		Tokwane		Matikwa		Dande	
	HBWL	RBWL	HBWL	RBWL	HBWL	RBWL	HBWL	RBWL
1. No control	0.31	0.25	2.83c	0.08	5.35h	2.82d	8.80e	0.75b
2Decis Forte @ 50ml/ha	0.06	0.06	0.67ab	0.00	0.65a	2.36cd	1.80bcd	0.00a
3Vantex @ 50ml/ha	0.12	0.13	1.17ab	0.00	2.35ef	2.26bcd	2.50cd	0.20a
4Vantex @ 100ml/ha	0.06	0.06	0.58ab	0.00	1.70cd	2.81d	1.65bcd	0.05a
5Vantex @150ml/ha	0.38	0.13	0.83ab	0.08	0.80a	2.24bcd	2.50d	0.05a
6.Dynamo @ 1250g/ha	0.25	0.25	1.08ab	0.08	3.25g	1.73ab	2.00cd	0.05a
7.Dynamo @ 2500g/ha	0.19	0.13	1.50b	0.00	2.35ef	1.68ab	1.90bcd	0.20a
8.Dynamo @ 3000g/ha	0.19	0.44	1.08ab	0.00	1.45bc	1.45a	2.20cd	0.05a
9. Blanket @ 125ml/ha	0.06	0.38	1.17ab	0.00	2.80fg	2.36cd	1.60bc	0.05a
10. Blanket @ 250ml/ha	0.06	0.63	1.00ab	0.00	2.15de	2.46cd	1.10ab	0.10a
11. Blanket @ 300ml/ha	0.06	0.44	0.33a	0.00	1.00ab	2.15bc	0.75a	0.15a
Mean	0.159	0.261	1.11	0.02	2.168	2.21	2.436	0.150
p-value	0.219	0.109	<.001	0.614	<.001	<.001	<.001	0.004
LSD (0.05)	0.274	0.401	0.386	0.124	0.476	0.526	0.784	0.197
CV (%)	119.2	106.2	22.7	378.7	15.2	16.5	22.3	19.3

Table 3: Effect of treatments on Bollworm larval counts at CRI, TokwaneMatikwa and Dande in 2020-21 Season. RBWL means Red Bollworm Larvae, HBWL means Heliothis Bollworm Larvae.

TRTS	CRI		Tokwane		Matikwa	
	HBWL	RBWL	HBWL	RBWL	HBWL	RBWL
1. No control	0.25	0.00	0.30	0.00	2.34g	1.19 f
2Decis Forte @ 50ml/ha	0.50	0.00	0.05	0.00	0.72 a	0.34 ab
3Vantex @ 50ml/ha	0.50	0.50	0.13	0.00	1.75f	0.69 bcde
4Vantex @ 100ml/ha	0.50	0.25	0.08	0.00	1.09abc	0.53 abc
5Vantex 150ml/ha	0.25	0.25	0.03	0.08	0.75a	0.22 a
6.Dynamo @ 1250g/ha	0.50	0.25	0.18	0.08	1.53 cdef	1.03 ef
7.Dynamo @ 2500g/ha	1.00	0.00	0.08	0.00	1.38 bcdef	0.78 cde
8.Dynamo @ 3000g/ha	0.25	0.25	0.05	0.00	1.09 abcd	0.56 abc
9. Blanket @ 125ml/ha	0.00	0.25	0.38	0.00	1.59 cef	0.97 def

10. Blanket @ 250ml/ha	0.75	0.00	0.03	0.00	1.19 abcde	0.63 bcd
11. Blanket @ 300ml/ha	0.50	0.00	0.03	0.00	0.97 ab	0.56 abc
Mean	0.46	0.16	0.12	0.00	1.31	0.68
p-value	0.663	0.667	0.074	0.00	<.001	<.001
LSD (0.05)	0.892	0.559	0.245	0.000	0.446	0.153
CV (%)	135.9	243.4	143.3	0000	23.6	10.5

Table 4: Effect of treatments on Bollworm larval counts at CRI, Tokwane and Matikwa in 2021-22 Season. RBWL means Red Bollworm Larvae, HBWL means Heliothis Bollworm Larvae.

	2020-21				**2021-22**
Treatment	**CRI**	**Tokwane**	**Matikwa**	**Dande**	**CRI**
1. No control	0.13acd	0.00	1.65e	0.44b	0.00
2.Decis Forte @ 50ml/ha	0.00a	0.00	0.60bc	0.06a	0.50
3.Vantex @ 50ml/ha	0.00a	0.00	1.20de	0.13a	0.00
4.Vantex @ 100ml/ha	0.00a	0.00	0.50ab	0.00a	0.00
5.Vantex @150ml/ha	0.19d	0.00	0.40ab	0.00a	0.00
6.Dynamo @ 1250g/ha	0.06abc	0.00	1.70e	0.00a	0.25
7.Dynamo @ 2500g/ha	0.00a	0.00	1.00cd	0.00a	0.00
8.Dynamo @ 3000g/ha	0.06abc	0.00	0.45ab	0.06a	0.25
9.Blanket @ 125ml/ha	0.00a	0.00	1.20de	0.06a	0.25
10.Blanket @ 250ml/ha	0.00a	0.00	0.70bc	0.00a	0.00
11.Blanket @ 300ml/ha	0.00ab	0.00	0.15a	0.00a	0.00
Grand Mean	0.040	- - -	0.86	0.068	0.11
p-value	0.020	- - -	<.001	0.014	0.297
LSD (0.05)	0.081	- - -	0.196	0.134	0.443
CV (%)	8.8	- - -	12.5	14.1	269.7

Table 5: Effect of treatments on Spiny bollworm Larva in 2020-21 and 2021-22 Seasons

	2020-21 Season							
		CRI				**Dande**		
Treatment	**Spider**	**C/Eggs**	**C/Larva**	**L/Larva**	**L/Adult**	**C/Eggs**	**C/Larva**	**Spider**
1. No control	0.38	0.56ab	0.00	0.44c	0.06ab	3.15c	0.35	1.45b
2.Decis Forte @ 50ml/ha	0.38	0.38a	0.00	0.18abc	0.19abc	0.35a	0.10	0.35a
3.Vantex @ 50ml/ha	0.69	1.00abc	0.00	0.06ab	0.00a	1.45b	0.05	0.40a
4.Vantex @ 100ml/ha	0.50	1.31c	0.06	0.00a	0.00a	1.20ab	0.10	0.50a
5.Vantex @150ml/ha	0.88	1.13bc	0.06	0.31bc	0.31abcde	1,20ab	0.10	0.80a
6.Dynamo @ 1250g/ha	1.13	2.00d	0.00	0.44c	0.38bcde	1.55b	0.20	0.60a
7.Dynamo @ 2500g/ha	0.81	0.75abc	0.06	0.06ab	0.06ab	1.20ab	0.05	0.40a
8.Dynamo @ 3000g/ha	0.50	0.81abc	0.06	0.18abc	0.06ab	0.90ab	0.10	0.80a
9.Blanket @ 125ml/ha	0.63	0.50ab	0.00	0.13ab	0.06ab	0.80ab	0.00	0.60a
10.Blanket @ 250ml/ha	0.63	0.31a	0.13	0.06ab	0.19abcd	0.90ab	0.05	0.55a
11.Blanket @ 300ml/ha	0.56	0.63abc	0.00	0.06ab	0.50ce	1.55b	0.00	0.80a
Grand Mean	0.642	0.852	0.034	0.176	0.165	1.295	0.100	0.659
p-value	0.157	<.001	0.730	0.006	0.012	<.001	0.437	0.042
LSD (0.05)	0.516	0.289	0.150	0.159	0.179	0.284	0.284	0.286
CV(%)	55.6	18.7	304.8	15.1	17.3	15.6	196.3	19.9

Table 6: Effect of Treatments on Predators at CRI and Dande in 2020-21 Season. C/Larva means Crysopa Larva, L/Larva means Ladybird larva, L/Adult means lady bird adult.

	2020-21 Season			**2021-22**
Treatment	**MATIKWA**			**MATIKWA**
	C/Eggs	**C/Larva**	**Spider**	**Spider**
1. No control	1.00b	0.70b	12.5f	0.19b
2.Decis Forte @ 50ml/ha	0.00a	0.15a	2.80cd	0.00 a
3.Vantex @ 50ml/ha	0.35a	0.40ab	4.50e	0.03 a
4.Vantex @ 100ml/ha	0.20a	0.10a	3.30de	0.00 a
5.Vantex @150ml/ha	0.00a	0.20a	1.80abc	0.00 a
6.Dynamo @ 1250g/ha	0.20a	0.10a	4.25e	0.06 a
7.Dynamo @ 2500g/ha	0.15a	0.15a	2.25bcd	0.00 a
8.Dynamo @ 3000g/ha	0.00a	0.30a	1.25ab	0.00 a
9.Blanket @ 125ml/ha	0.25a	0.20a	3.55de	0.03 a
10.Blanket @ 250ml/ha	0.15a	0.10a	2.30bcd	0.00a
11.Blanket @ 300ml/ha	0.00a	0.00a	0.80a	0.00 a
Grand Mean	0.209	0.218	3.60	0.0284
p-value	0.018	0.048	<.001	<.001
LSD (0.05)	0.286	0.204	1.188	0.074
CV(%)	27.1	18,8	22.8	5.9

Table 7: Effect of Treatments on Predators at Matikwa in 2020-21 and 2021-22 seasons. C/Eggs means Crysopa Eggs, C/L means Crysopa Larva.

CONCLUSION: Vantex at 150ml/ha, Blanket at both 250ml/ha and 300ml/ha were comparable to Decis Forte for Red, Heliothis and spiny bollworms as well as predator preservation. Dynamo was comparable to Decis Forte in preserving predators at all its levels as shown by Matikwa for both seasons but was outcompeted by Decis Forte in Heliothis bollworm control. Its 2500g and 3000g/ha were comparable to Decis Forte for RBWL and spiny bollworm control.

RECOMMENDATIONS: Vantex at 150ml/ha and Blanket at both 250ml and 300ml/ha are recommended for registration on the The research trial was conducted at experimental farm of Central Cotton Research Institute Sakrand during the year 2020 to assess

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