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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences, 1 (4): 248-251, 1998 Research Article

Influence of Pest Management Levels on the Yield of Different Cotton Strains

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Abstract

Thirty four cotton strains were planted in three field experiments with three levels [A (intense pesticide use), B (intermediate use of pesticides) and C (low pesticide use)] of pest management at the University of Georgia, Coastal Plain Experiment Station, Tifton, USA. The susceptible cultivar, Stoneville 213, cotton line was compared with STHG 3-1, STHG 4-4, LAHG 820060, ARS-TX-HIGOS2, LAHG 810065, LAHG 810063, ARS-TX-HGOSI and ARS TX-HIGOS3, TIFCOT 56 and TAMCOT CD 3H, GATIR-84-662, PD-0786, 86MRH-7, MISCOT TB-27-96, MSCOT 7913-S, MISCOT 7913-84 JBW 503 and UARK 2402, JBW 504, GATR 84-634, GATIR 84-664, GATIR 84-663, GATIR 84-635 and MISCOT 7913-84 had equal yield. The other lines either did not differ from Stoneville 213 in yield or had less yield than the latter. There was a difference in yield, seed cotton kg ha^{-1} and or lint kg ha^{-1} in all levels indicating that the management levels had some influence on the yield of different strains.

Key words: Susceptible Cultivar, Yield, Pest management, Seed-cotton, Cotton strains, Lint yield, Defoliants

Introduction

Based on Kojel and Lewis (1984), cotton is at once a fiber, food and feed crop. It is a unique crop species that has been a participant in many epics of history and is grown on more than 32 million hectares of land in the world (Anonymous 1988). It is attacked by a complex of insect pests and receives massive amounts of pesticides from their control (Gutierrez *et al*., 1981). Based on Adkisson *et al*. (1982) almost 50% of all insecticides applied to crops in United States are applied to cotton, based on Metcalf (1994), insecticides are the most powerful tool available for use in cotton yield increases with 3 of the 4 insecticides treatments when compared with the untreated check. Jenkins *et al*. (1981) reported seed cotton yields from 1973 to 2922 kg ha^{-1} when insecticides were used. They further reported the per ha yield of the commercial variety Stoneville 213 as 2540 kg under similar situation. Hopkins *et al*. (1985) also studied the influence of insect damage and insecticide spray regimens on cotton yield.

The objective of these studies is to see the influence of Insect Management levels on the yield of different cotton strains using Stoneville 213, a commercial, susceptible check.

Materials and Methods

Three field experiments were conducted at the university of Georgia, Coastal Plain Experiment Station Tifton, Georgia, USA.

In experiment 1, twenty strains of cotton (including Stoneville 213 as a susceptible check) were planted in May 13 at the Ponder Experimental Farm in plots maintained under three levels (A, B, C) of pest management. In level A, cypermenthrin (CymbushR 3E), a pyrethroid and broad-spectrum insecticide was applied at a rate of 0.056 kg ha^{-1} twice weekly for fourteen times from July 15 through September 2. In level B, the insecticides were applied at the same rate at two weeks intervals for four times from July 18 through August 29, while in level C, no insecticides were applied. The three levels were kept separate from one another to avoid drift from pesticidal applications. The cotton lines were replicated three times in each level using randomized block designs. The plots consisted of two rows, 10.67 m in length ans 1.83 m in width. Fertilizer (5-10-15) was applied at a rate of 42.01, 84.028, 126.04 kg of N, P, K per ha, respectively. Also 33.61 kg of nitrogen/ha was side dressed four weeks after planting.

In experiment 2, twenty cotton strains, including 14 new lines not evaluated in experiment 1, were planted on May 8 at the Ponder Experimental Farm. The experimental details were the same as in Experiment 1 except for pesticidal regimes in levels A and B. In level A, cypermethrin was applied at the same rate/internal as in Experiment 1 for 17 times from July 6 through September 1. In level B, the insecticide was applied at the same rate number and interval as in 1986 from July 14 through August 25. Also during this year, due to an obligatory federal boll weevil eradication program, azinphosmethyl (GuthionR 2L), an organophosphate insecticide was applied using 0.28 kg(ai) ha^{-1}, twice weekly from July 6 through November 12 for a total of 30 applications in all plots.

Experiment 3 was conducted in field ca 15 km from experiments 1 and 2 near the main campus of Coastal Plain Experiment Station, Tifton. Five lines of cotton (including Stoneville 213) were planted on May 28. A split plot experimental design was used with three replications. The three levels of pest management (A, B and C) were

replicated three times within each replication and within each level, the cotton lines were planted in a random order. Fertilizer was applied at the same rate as in experiments 1 and 2. Cypermethrin was applied at the same rate and interval as in experiment 1 and 2 from July 7 through September 8 for seventeen times in level A and from July 13 through September 1 for four times in level B. In the last week of July, an infestation of aphids, *Aphis gossyppi* Glover, developed. Accordingly, dicrotophos (BidrinR 8EC) was applied using 0.224 kg (ai) ha^{-1} on August 7 in all the levels. Due to an obligatory federal boll weevil eradication program, Guthion 2L was applied at a rate of 0.28 kg (ai) ha^{-1}, weekly from September 16 through November 12, for a total on nine times TX-6 nozzles/row, ground speed 4.83 km ha^{-1} delivering 77.6 L of total spray volume/ha was used in all the experiments fo apply the insecticides.

Approximately ten days before harvest, a tank mix of the defoliants, DroppR 50 WP [0.23 kg (ai) ha^{-1}] + DEFR 6EC [0.84 kg (ai) ha^{-1}] were applied in all the three experiments. The cotton was harvested in experiments 1, 2 and 3 on November 15, 19 and 13 respectively. In experiment No. 1, cotton yield was recorded as lbs of lint/plot, while in experiments No. 2 and 3 as lbs of seed-cotton/plot. Yields recorded were adjusted to kg of lint and/or seed-cotton/ha. The statistical analysis in experiments 1 and 2 was done as three randomized block design nested with the main plots, while in experiment No. 3, as a split plot design using SAS (SAS Institute 1986). T Test (LSD) as recommended by Benedict (1983) were applied to the means.

On the basis of groupings of the T Tests and comparing with Stoneville 213, the lines were classified as having high yield, when the yield was significantly higher than Stoneville 213; equal yield, when the yield did not differ significantly from Stoneville 213; low yield, when the yield was significantly lower than Stoneville 213 and intermediate when the yield was in between the qual and low.

Results and Discussion

Experiment 1: The means of the entries of the three levels show that 86MRH-6. TXCDP 37 HH showed low lint yield, TAMCOT CAB-CS had and intermediate lint yields, while all other lines did not differ significantly from Stoneville 213. The entries different significantly within levels in yield. Stoneville 213 showed the highest lint yield in level A but it did not differ significantly from the other lines excluding GATIR 84-663, GATIR 84-634, GATIR 84-664, 86 MRH-6, 86 MRH-7, TAMCOT-CAB-CS and TXCDP 37HH which showed less yield. In level B, 86MRH-6, TXCDP 37HH and TAMCOT-CAB-CS showed less lint yield than Stoneville 213. In level C, 86 MRH-7, JBW504, LAHG 810063, UARK 2402, GATIR 84-664 and GATIR 84-662 showed significantly more lint yield Stoneville 213 (Table 1).

The level A showed the highest lint yield, level B intermediate while level C the lowest.

Experiment 2: MO 84-701 showed numerically the highest yields of seed-cotton, but did not differ significantly from

Table 1: Lint yield (kg ha^{-1}) of selected cotton strains grown under three levels of pest management Tifton, GA; 1986

	Levels of Pest Management			
Cotton strains	A*	B*	C*	Means*/(A, B, C)
86 MRH-6	763.3def	418.1d	306.4ab	495.9f
86 MRH-7	700.5ef	647.4abc	461.4a	603.1c-f
MISCOT TB27-86	958.8abc	734.1ab	379.8ab	690.9a-d
MISCOT 7913-S	944.4a-d	626.6a-d	332.1ab	634.3a-e
MISCOT 7913-H	990.4abc	818.0a	385.4ab	731.2ab
JBW 503	995.9abc	630.8a-d	333.0ab	653.2a-d
JBW504	907.3a-d	668.0ab	481.5a	685.6a-d
TXCDP 37HH	650.0f	466.7cd	389.4ab	502.0f
PDO-786	949.9a-d	694.6ab	289.2ab	644.6a-d
LAHG 810065	1062.9ab	564.9bcd	309.3ab	645.7a-d
LAHG 810063	905.7a-e	763.9ab	502.3a	724.0abc
UARK 2402	1074.2ab	718.8ab	436.2b	743.1a
Stoneville 213	1110.91a	742.2ab	210.8b	688.0a-d
GATIR 84-634	818.8cde	554.0bcd	376.9ab	583.2def
GATIR 84-655	1069.9ab	729.6ab	365.8ab	721.8abc
GATIR 84-664	797.7c-f	596.6bcd	432.3a	608.9c-f
GATIR 84-663	881.2cde	563.6bcd	414.4ab	619.8a-f
GATIR 84-662	959.7a-d	764.3ab	499.9a	741.3a
GATIR 84-635	1047.5ab	635.8a-d	363.5ab	682.3a-d
TAMCOT CAB-CS	694.4ef	459.9cd	398.7ab	517.7ef

Means within columns followed by the same letters are not significantly different based on T test (LSD), DF = 114, p = 0.05, *LSD = 219.54; LSD for */ = 126.75. Critical value of T = 1.98099, A* = High, B* = Medium and C* = Low

Table 2: Lint yield (kg ha^{-1}) of selected cotton strains grown under three levels of pest management (Experiment No. 2) Tifton, GA; 1987

	Levels of Pest Management			
Cotton strains	A*	B*	C*	Means*/(A, B, C)
PD-0786	2168ab	1887c-f	1849abc	1968-be
STHG 4.4	1825b	1346f	1670abc	1614f
STHG 3-1	1942ab	2176a-d	1734abc	1951b-e
STHG 6-4	2183ab	1981b-e	1632bc	1932b-f
LAHG 810063	2211ab	1555ef	1586bc	1784c-f
LAHG 810060	2290ab	2167a-d	1847sbc	2102abc
LAHG 810065	2051ab	1499ef	1717abc	1756def
TAMCOT CAB-CS	1799b	2463abc	1920ab	2061a-d
TAMCOT CD3H	1884ab	1757def	1331c	1657ef
ARS-TC-HIGOST1	2143ab	2022b-e	1471bc	1879b-f
ARS-TC-HIGOST2	1860b	1957cde	1695abc	1837c-f
ARS-TC-HIGOST3	2299ab	1790def	1836abc	1975b-e
MO 84-701	2308ab	2665a	2120a	2364a
DES 920	2317ab	2535ab	1455bc	2102abc
MISCOT TB 27-7	1760b	2030b-e	1573bc	1787c-f
MISCOT 7913-835	2061ab	1976b-e	1649abc	1895b-f
MISCOT 7913-51	2240ab	1802def	1932ab	1992bcd
Stoneville 213	2449a	2241a-d	1904abc	2198ab
GATIR 84-662	2055ab	1946cde	1487bc	1830c-f
TIFCOT 56	2288ab	1961b-e	1734abc	1994bcd

Means within columns followed by the same letters are not significantly different based on T test (LSD), DF = 114, p = 0.05, *LSD = 219.54; */LSD = 333.41. Critical value of T = 1.98099, A* = High, B* = Intermediate and C* = minimum

Table 3: Seed cotton yield (kg ha^{-1}) of selected cotton strains grown under three levels of pest management (Experiment No. 3) Tifton, GA; 1987

	Levels of Pest Management			
Cotton strains	A*	B*	C*	Means*/(A, B, C)
LAHG 810063	2170.3abx	1201.4byz	1763.4ax	1711.8a
Stoneville 213	2499.7ax	1240.2aby	1162.7bcy	1634.2ab
MISCOT 7913-84	2344.7ax	1685.8axy	1589.0aby	1873.2a
ARS-TX-HIGOSI	988.3cx	988.3bx	1007.6cx	994.7x
STHG 4-4	1763.4bx	1337.0abx	1182.0bcx	1427.5b

Means with in cilumns followed by the same small and within rows by the same capital letters are not significantly different based on T test (LSD), p = 0.05, *LSD, DF and critical value for columns: 463.24, 24 abd 2.06390; for rows: 749.1156502, minimum applications of the insecticides

Stoneville 213, DES 920, LAHG 810060 and TAMDCOT CAB-CS. All other strains excluding ARS-TX-HIGOS2, GATR 84-662, MISCOT TB-27-7, LAHG 810063, LAHG 810065, TAMCOT CD3H and STHG 4-4 were statistically similar to Stoneville 213. The former lines are classified as possessing intermediate yield while STHG 4-4 had a low yield (Table 2). Level A had the highest yield of seed cotton, level B intermediate while C had the lowest yield.

Experiment 3: The highest yield of seed-cotton was shown by LAGH 810063 and MISCOT 7913-4 but not significantly different from that Stoneville 213. STHG 3-3 had an intermediate yield while ARS-TX-HGOS a low yield when compared with Stoneville 213. The latter two strains did not differ significantly among levels (Table 3). MISCOT 7913-84 although showing susceptibility to Stoneville 213 in yield which indicates tolerance to the attack of insect pests-a kind of resistance as classified by Painter (1951). No significant difference in yield occurred among management levels (Table 3). Concluding the results of the 3 experiments, it could be said that STHG 6-1, STGH 4-4, LAGH 820060, ARS-TX-HIGOS 2, LAHG 810063, ARS-TX-HIGOS 2, LAHG TXPHIGOS3, TFCOT 56, TMCOT CD 3H, GATIR 84-662, PD-0786, MISCOT 7913-S, MISCOT 7913-H, JBW 503, UARK 2402, JBW 504, GATIR 84-634, GATIR 84-665, GATIR 84-664, GATIR 84-663, GATIR 84-635 and MISCOT 7913-84 had equal yield when compared with Stoneville 213. The other lines either did not differ from the standard in yield or had less yield in all the levels indicating in the yield of different cotton strains. Metcalf (1994) has indicated insecticides as the most powerful tool of pest management. Hopkins *et al*. (1985) had also

reported the influence of insecticide spray regiments on cotton yield. Jenkins *et al*. (1981) had reported seed cotton yield from 1973 to 2922 kg ha^{-1} when insecticides were used. Also similar results are found in our studies. The yield of Stoneville 213 is also similar as reported by Jenkins *et al*. (1981). Watson (1974) had also shown significant cotton yield increase with insecticide uses.

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