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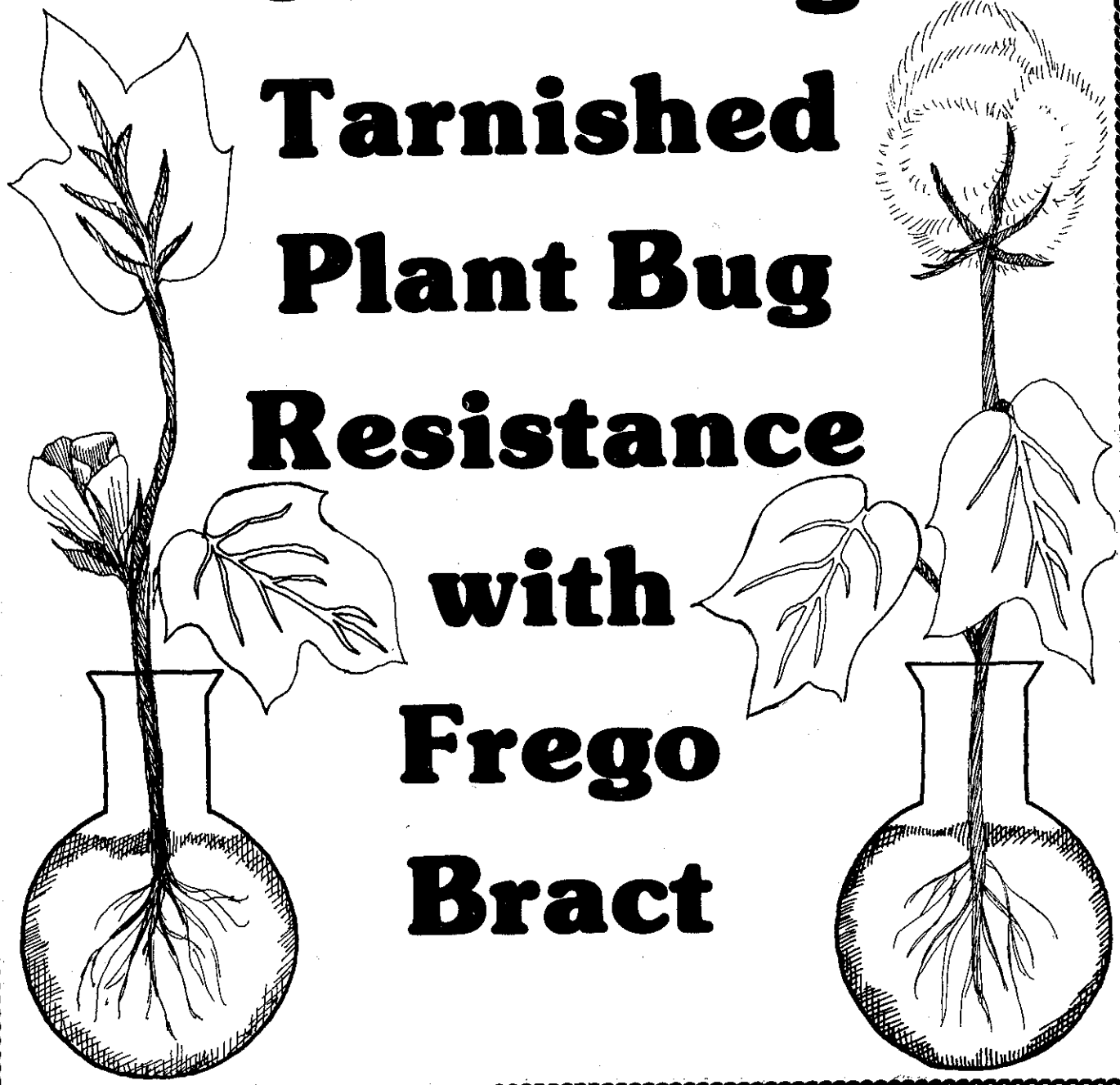

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Abstract

Three crosses, (A) La Frego 2 X Timok 811, (B) Timok Frego from cross A X D7146N and (C) the F_1 of cross B X D7146N, were made and several progeny in F_3 through F_5 of each cross were evaluated in field plots with a high population of tarnished plant bugs, *Lygus lineolaris* (Palisot de Beauvois), in 1978, 1979 or 1980. We tested the hypothesis that resistance to tarnished plant bugs by frego strains can be improved by combining earliness and genetic resistance of Timok 811 with the nectariless trait of D7146N. We found that this hypothesis was valid because we were able to develop frego strains with tarnished plant bug resistance and earliness comparable with that of Timok 811, and yield, boll size and lint percent comparable with that of La Frego 2 and D7146N. Results of this study also indicated that Timok 811 is a useful genetic source of resistance to tarnished plant bug.

The frego bract trait in cotton, *Gossypium hirsutum* L., produces long, narrow and twisted bracts that tend to curl outward, leaving the flower bud and subsequent boll more exposed than do the flat, triangular bracts of normal cotton. This trait was found to be associated with resistance to the boll weevil by Jenkins and Parrott (1971) and resistance to boll rot by Jones and Andries (1969), and has been shown by Parrott et al. (1973) to enhance insecticidal coverage. A major limitation of this trait is its extreme sensitivity to the tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois) (Lincoln et al., 1971), an early season insect and economic pest on cotton in much of the Southeastern cotton belt. Damage results in dead terminals, abscission of squares and altered forms of vegetative and fruiting growth patterns that usually are associated with yield losses and delayed maturity.

Variable sensitivity of frego-bract cotton lines to the tarnished plant bug has been reported by Naresh (1977). He investigated frego bract in eight genetic backgrounds grown with high levels of plant bugs. The frego trait in 'Auburn 56', Arkansas Stormproof, 'Acala 1571D' and TX-ORH-37 produced higher yields than did frego of other backgrounds.

Several traits of normal-bract cotton and the Timok 811 source of resistance have been identified as providing moderate resistance to this early season pest. The most important of these are the nectariless trait (Meredith et al., 1973 and Schuster and Maxwell, 1974) and the Timok 811 source of resistance (Jenkins and Parrott, 1976; Lambert, 1977 and Jenkins et al., 1977). The purpose of this study was to determine if resistance to tarnished plant bug by frego strains can be improved by combining earliness and the genetic resistance of Timok 811 with the nectariless trait of D7146N.

Materials and Methods

We used three sources of genetic material. Timok 811 (accession 1082 in the Regional Collection) has a low lint percent (23.4) and yield (Anonymous, 1974); however, it is moderately resistant to tarnished plant bugs *Lygus lineolaris* (Palisot de Beauvois) and very early. La Frego 2, a strain from Louisiana, has the frego-bract trait and has high lint percent and boll size. In the absence of tarnished plant bugs its yield is medium. It is highly susceptible to tarnished plant bugs as are most frego strains. D7146N, a nectariless strain of the Deltapine type, has high yield, average boll size and high lint percent. Nectariless gives it moderate resistance to tarnished plant bugs.

We used three crosses in this study---(A) La Frego 2 X Timok 811, (B) Timok Frego from cross A X D7146N and (C) the F_1 of cross B X D7146N. Several progeny from cross A were evaluated in F_3, F_4 and F_5 in 1978, 1979 and 1980, respectively, by growing them in field plots with large populations of tarnished plant bugs. Progeny from crosses B and C were grown in 1979 and 1980. We tested the hypothesis that resistance to tarnished plant bugs by frego strains can be improved by combining earliness and resistance from Timok 811 with nectariless from D7146N.

All plots were grown at the Plant Science Research Center, Mississippi State University on a Leeper silty clay loam, fine montmorillionitic, nonacid, thermic, chromondertic Haplaquept, 0-2% slope. Field plots were two rows spaced 1 meter and were 11.6, 6.1 and 8.5 meters long in the three years, respectively. Four rows of cotton were bordered by two rows of mustard, *Brassica juncea* (L.) Czern and Coss. The mustard attracted tarnished plant bugs and provided a nurse crop to build up their numbers (Laster and Meredith, 1974).

Plots were planted May 17, 16 and April 30 in 1978, 1979 and 1980. Insecticide programs on all plots were initiated August 10, 1 and July 2 in the three years. This allowed plant

bugs to damage the plants early but controlled them and other pests later in the season.

Boll samples were hand harvested each year to evaluate lint percent and boll size. Plots were mechanically harvested on September 22 and October 12 in 1978, on October 10 and 31 in 1979 and on September 18 and October 14 in 1980. Earliness was measured as the percentage of total yield at first harvest each year.

These techniques measured tarnished plant bug resistance and the ability to yield under high numbers of plant bugs during the early part of the fruiting season.

Results and Discussion

We report data only from the highest-yielding and earliest selections after three years of testing five frego selections from cross A. We generally were successful in improving lint percent, boll size and earliness over that of the Timok 811 parent. Stoneville 817 frego was as susceptible as La Frego 2, but none of the five frego lines yielded as well as did Stoneville 817 frego when plant bugs were present (Table 1). We used this line because it was the highest-yielding frego line in our program at the time. The extreme earliness and low lint percent of the Timok 811 parent apparently was troublesome in this cross.

We evaluated several nectariless and frego nectariless progeny from cross B expecting them to perform better agronomically than does cross A. Data from five nectariless selections and five frego nectariless selections with the best agronomic performance and resistance are presented in Table 2. Yield of three of these four nectariless strains was similar to that of D7146N in 1979 and 1980. All were significantly earlier than D7146N. The five frego nectariless strains were significantly earlier than Stoneville 817 frego, but only one was as early as D7146N. Selection 22 yielded as well as D7146N and far better than Stoneville 817 frego when grown with high numbers of plant bugs. Performance of this frego nectariless strain indicated that we were successful in combining frego with nectariless to produce a strain that was as early and productive, and as resistant to plant bugs as the normal-bract strain D7146N.

The performance of several backcross progeny from cross C was evaluated in 1979 and 1980. Data from five nectariless selections with the best agronomic performance and resistance are presented in Table 3. Lint percentage and boll weights were not different from those of D7146N. Yield of each of the selections was comparable to that of D7146N in 1979, but only 12NE yielded as well as did D7146N in 1980. All five strains were earlier than D7146N.

Results of this study indicate that our hypothesis was valid, because we were able to develop frego strains with improved tarnished plant bug resistance by combining earliness, genetic resistance to the plant bug and nectariless into such strains.

These data also indicate that frego strains can be used in plant bug areas if we combine frego with earliness and plant bug resistance from a source such as Timok 811. This would allow us to use the advantages of frego, such as resistance to boll weevil, *Anthonomus grandis* (Boheman) (Jenkins and Parrott, 1971), resistance to boll rots (Jones and Andries, 1969) and improved insecticide coverage (Parrott et al., 1973).

Table 1. Agronomic performance of selections from cross A (Timok 811 X La Fg 2) when grown with high populations of tarnished plant bugs.

		1978			1979			1980				
Selection	Cross	1st pick	Total pick	% 1st pick	1st pick	Total pick	% 1st pick	1st pick	Total pick	% 1st pick	Lint %	Boll size
		kg/ha										g
1 FG	A	488	755	65	426	500	85	781	876	89	37.6	4.75
4 FG	A	505	723	68	408	498	82	717	854	84	37.4	4.75
7 FG	A	430	738	58	411	514	80	787	915	86	37.6	4.76
8 FG	A	415	701	60	444	529	84	720	842	86	37.9	4.50
10 FG	A	467	674	67	421	511	83	659	786	84	36.6	4.72
ST817FG	A	466	809	55	242	366	66	697	1046	67	41.3	5.09
LSD .05	A	153	169	10	72	76	7	127	108	7	1.6	0.29

Table 2. Agronomic performance of selections from cross (B Timok 811 FG X D7146) when grown with high populations of tarnished plant bugs.

		1979			1980				
Selection	Cross	1st pick	Total pick	% 1st pick	1st pick	Total pick	% 1st pick	Lint %	Boll size
		kg/ha			kg/ha				g
2 NE	B	477	672	71	906	1065	85	36.3	4.45
3 NE	B	323	650	50	918	977	94	38.7	4.24
4 NE	B	407	617	66	894	971	92	37.1	5.03
7 NE	B	462	599	77	831	890	93	37.3	4.53
8 NE	B	524	657	80	899	965	89	37.4	4.47
11 FGNE	B	195	373	52	719	889	81	37.9	4.94
12 FGNE	B	187	357	52	699	891	77	38.1	5.05
15 FGNE	B	345	500	69	781	859	91	35.8	5.01
21 FGNE	B	235	368	65	745	954	78	38.9	4.93
22 FGNE	B	259	445	58	900	1046	86	38.1	5.41
ST817FG	B	130	297	44	697	1046	67	41.3	5.09
D7146N	B	267	543	49	907	1002	91	38.6	5.38
LSD .05	B	85	118	8	127	108	7	1.6	0.29
D7146N	B*				961	1108	87	36.8	5.38
LSD .05	B*				112	118	2	1.2	0.35

*Comparisons with NE lines in 1980.

Table 3. Agronomic performance of selections from cross C [(Timok 811 FG X D7146) x D7146] when grown with high populations of tarnished plant bugs.

		1979			1980				
Selection	Cross	1st pick	Total pick	% 1st pick	1st pick	Total pick	% 1st pick	Lint %	Boll size
		kg/ha			kg/ha				g
7 NE	C	528	734	72	813	886	92	34.8	5.11
9 NE	C	545	753	72	886	958	93	36.5	4.77
10 NE	C	371	527	70	864	943	92	35.6	5.09
12 NE	C	512	744	69	983	1069	92	35.8	5.15
15 NE	C	534	768	70	842	938	90	35.6	4.80
D7146N	C	299	664	45	961	1108	87	36.8	5.38
LSD .05	C	NS	NS	1	112	118	2	1.2	0.35

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