Research Note

COMBINED EFFECT OF LARGE CRABGRASS AND SMOOTH PIGWEED DENSITIES ON SNAP BEAN YIELD[1]

wAnnual weeds may compete with snap bean (*Phaseolus vulgaris* L.) and reduce yields. Two weeds that can be commonly found in the same snap bean field in Arkansas are large crabgrass [*Digitaria sanguinalis* (L.) Scop.] and smooth pigweed (*Amaranthus hybridus* L.).[2] In a study with a mixed weed population, Mitich and Fennimore[3] reported that barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.] and black nightshade (*Solanum nigrum* L.) caused a 30 to 40% yield reduction in dry beans. Dawson[4] determined the competitive effect of a complex of barnyardgrass, pigweeds and common lambsquarters (*Chenopodium album* L.) on snap bean yield. A significant yield reduction occurred when this complex was allowed to compete for 5 to 7 weeks after planting. However, neither Dawson nor Mitich and Fennimore determined the relative contribution of each weed in the weed complex on the overall yield losses. Most competition studies with crops have evaluated the effect of individual weed species. Although this information is basic to the understanding of the nature of the effects of specific weeds on snap bean yield, few fields are infested with only a single species. Therefore, the objective of this study was to determine the effect of combined large crabgrass and smooth pigweed individually and as a complex on snap bean yield.

Experiments were conducted in 1989 during the spring and early summer (May-June) and late summer and early fall 1989 (August-September) at the Main Agricultural Experiment Station at Fayetteville, Arkansas, on a Captina silt loam soil (Typic Fragiudult) with 1% organic matter and a pH of 5.6. The experimental area was fumigated with 268 kg/ha of methyl bromide in the spring 2 weeks before planting to destroy viability of unwanted weeds.

The experimental design was a randomized complete block, and treatments were replicated four times. Plot size was 1 row (1 m spacing) by 3 m long. Seeds of snap bean "Benton" were planted to a depth of 2.0 to 2.5 cm in the center of each row with a mechanical planter at a rate of 30 seeds per meter. Large crabgrass (LC) and smooth pigweed (SP) seeds were planted within 7 to 10 cm from the snap bean drill with each species planted separately on one side of the row. Seeding rate was 1 g/m for smooth pigweed and 2 g/m for large crabgrass. Weed seeds were planted to a depth of 1.5 to 2.0 cm. Six large crabgrass and smooth pigweed density ratio were established by using a modified replacement series. Densities were established within 2 weeks after snap bean and weed emergence. Snap bean plants were thinned to 23 plants per square meter. Final ratios of large crabgrass/smooth pigweed were 200/0, 150/7.5, 100/15, 50/22, 0/30 plants per square meter. A weed-free check was included. Weed interference was maintained for the entire season. Hand weeding was used to eliminate unintended weeds. Overhead sprinkler irrigation was applied as needed. Ammonium nitrate was sidedressed at a rate of 29 kg/ha at flower initiation. The in-

[1]Manuscript submitted to Editorial Board 15 July 1993.

[2]Monks, C. D. 1985. Weed control systems in narrow-row snap bean (*Phaseolus vulgaris* L.) MS. Thesis, University of Arkansas, Fayetteville, AR.

[3]Mitich, L. W. and S. A. Fennimore. 1982. Dry bean weed control in California. Research Progress Report. p. 29.

[4]Dawson, J. H. 1964. Competition between irrigated field beans and annual weeds. WEEDS 12: 206-208.

ner 2 m of row from each plot was harvested to obtain snap bean yield. Smooth pigweed and large crabgrass from the same 2 m section were harvested. Dry weight of each weed species was recorded after the plants were oven dried at 34° C for 1 week. Yield reduction was computed on the basis of the yield of the weed-free treatment by [(yield of weed-free check-yield of the treatment/yield of weed-free check) x 100]. Analysis of variance was used to determine differences among the treatments. Means were separated by using Fisher's protected LSD test at the 0.05 level of probability.

The effect of large crabgrass and smooth pigweed ratios on snap bean yield varied between the spring and fall experiments. Yield was reduced by large crabgrass and smooth pigweed in the spring experiments, but not those in the fall (table 1). Differences between spring and fall can be attributed to differences in weed growth. Weeds were more vigorous in the spring than in the fall as indicated by increased weed dry weight. Decreased weed growth in the fall experiment was most likely a result of the low amount of rainfall and the high temperatures that prevailed during that period. In the spring, when weeds were combined in different densities, snap bean yield reduction varied between 35 and 53%. However, there were no differences among density ratios. The intermediate density ratio of 100/15 plants per square meter (large crabgrass/smooth pigweed) contributed approximately 50% each to the final dry weight. In the fall experiment, yield and growth of snap bean under all density ratios were similar. In the fall experiment, average contribution of smooth pigweed to final dry weight was approximately 99% whereas that of large crabgrass was less than 1%. Average con-

TABLE 1.—*Interference of large crabgrass (LC) and smooth pigweed (SP) ratio on snap bean yield reduction and dry weight associated with weed ratios in experiments established in the spring and fall of 1989*

		Dry weight		
LC/SP[1]	Yield reduction	Large crabgrass	Smooth pigweed	Total[2]
	%	kg/ha	kg/ha	kg/ha
		Spring		
0/0[3]	0	0	0	0
200/0	35	3008	0	3008
150/7.5	41	1087	1544	2631
100/15	37	1101	1069	2170
50/22	37	897	1748	2645
0/30	53	0	2497	2497
LSD (0.05)	20	324	613	749
		Fall		
0/0	0	0	0	0
200/0	10	45	0	45
150/7.5	18	4	682	687
100/15	24	3	753	756
50/22	23	7	859	866
0/30	22	0	843	843
LSD (0.05)	NS	30	251	250

[1]Weed ratio of large crabgrass and smooth pigweed in plants per square meter.
[2]Large crabgrass and smooth pigweed combined.
[3]Weed-free plots.

tribution of smooth pigweed in spring was 58%, whereas that of large crabgrass was 42%. These data show a contrast between seasons.

The interference of 200 LC per square meter was not different from that of 30 SP per square meter with respect to yield reduction of snap bean and weed biomass in spring. Results indicate that the interference by 6.7 LC per square meter is equivalent to one SP per square meter (200 LC/30 SP). Weed ratios of 200/0, 150/7.5, 100/15, 50/22 or 0/30 did not differ in causing yield reductions in spring.

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