

COMPETITION AND PROLIFERATION OF FOUR SMARTWEED SPECIES IN COTTON

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Abstract

Several species of smartweed may infest U.S. cotton. The most common are Pennsylvania smartweed (*Polygonum pensylvanicum*), pale smartweed (*P. lapathifolium*), and ladysthumb (*P. persicaria*). In North Carolina, another species, tufted knotweed (*P. caespitosum*), is common in lawns and wooded areas and sometimes found in cotton. Control of these species by herbicides may differ (e.g. Command herbicide controls Pennsylvania and pale smartweed but doesn't control ladysthumb) so an identification to species is important. Little is known about the competitive effect of these species in cotton so separate studies were conducted to evaluate competition and seed rain of these four species in 'Stoneville BXN 47 cotton'.

Studies were conducted at Clayton, NC in 1998. Each species was planted five inches from the cotton row at 0, 1, 2, 4, 8, 16, and 32 plants per 30 row feet. An additional treatment had no cotton and one weed per 30 row feet to simulate a no-competition environment. Undesirable weeds were removed throughout the season. Height of four cotton and weed plants and diameter of weed canopies were determined biweekly throughout the season. At seasons end just before cotton harvest, all seed remaining on plants were hand harvested then all weeds were carefully removed and fresh and dry weights of four weeds were obtained. To account for seed fallen prior to harvest, seed on the ground were counted within four four-inch diameter randomly-placed rings. Cotton was then harvested and lint yield determined.

No smartweed affected cotton height at any density until at least nine weeks after planting. This indicates a wide window for time of removal by postemergence herbicides. However, our densities mimic escaped populations and are too low to indicate that preemergence herbicides are not needed. This is evidenced by the fact that no density effect was observed on weed dry weight. However, dry weight increased in absence of cotton competition. For example, average ladysthumb dry weight was 1 lb per plant regardless of density, but increased to 6 lb per plant without cotton competition. This suggests two things: 1) our densities in cotton were too low to cause intraspecific weed competition, and 2) the smartweeds have the ability to exploit more resources if given the opportunity. Late in the season 16 and 32 plant densities of all species except tufted

knotweed reduced cotton height by 6". Average cotton height was three feet while smartweed heights were as much as 8, 7.7, 6, and 2.3 feet for pale smartweed, ladysthumb, Pennsylvania smartweed, and tufted knotweed, respectively. This height combined with over 10 feet diameter of some plant canopies would make cotton harvest difficult to impossible if weeds are not controlled.

There was a negative linear effect on cotton lint yield from increasing densities of all four species. Within the range of densities evaluated, Pennsylvania smartweed, pale smartweed, ladysthumb and tufted knotweed reduced cotton lint yield 31, 27, 24, and 9 lb/A for each weed in 30 row feet. Excluding tufted knotweed, yield reduction was 0.02% per weed in every 30 row feet regardless of weed species. A typical herbicide program in BXN cotton including tillage and seed costs and using soil-applied and layby herbicides with one application of Buctril cost \$46.15. A selling price of \$0.65/lb cotton lint indicates a break-even threshold of 71 lb lint/A or about 2.3, 2.6, and 3 weeds per every 30 row feet per acre for Pennsylvania smartweed, pale smartweed, and ladysthumb, respectively. However, this excludes negative impacts on harvest including equipment damage, poor lint removal due to gummed machinery, and increased trash and stain that could be caused by such large weeds.

Another consideration not included in the simple threshold above is seed rain. Seed rain of all four species increased linearly with increasing density. Considering ground and on-plant enumeration, seed rain was 17.5, 5.5, 4.3, and 1.6 million seed per acre for every plant per 30 row feet for pale smartweed, Pennsylvania smartweed, ladysthumb, and tufted knotweed, respectively. At cotton harvest, 83 and 89% of mature seed were still on ladysthumb and pale smartweed plants, respectively. Only 64 and 36% of mature seed remained on Pennsylvania smartweed and tufted knotweed plants, respectively. This is probably due to differing flowering dates between the four species and will be evaluated next year. Many would argue that seed rain is not important since soil seed banks commonly contain more seed than can be produced in one season, however reduction in seed rain may limit the spread of smartweed and reduce subsequent management inputs.