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Thor Kommedahl
University of Minnesota

M. E. Tumbleson
University of Minnesota

BOTANY

THE ECOLOGICAL EFFECT OF A PRECEDING CROP ON SMARTWEED IN FLAX [1]

THOR KOMMEDAHL AND M. E. TUMBLESON
University of Minnesota, St. Paul

INTRODUCTION

Dunham *et al.* (1958) recently reviewed many studies on the effects of weeds on growth of crop plants, but virtually nothing has been reported on the effect of different crop plants on weed populations of the subsequent crop. They reported also that two different crop rotations that included flax did not control annual weeds satisfactorily in a flax crop over a 10 year period.

Kommedahl and Linck (1958) reported that yellow foxtail (*Setaria glauca* (L.) Beauv.) was abundant in flax that followed itself or four other crops when an herbicide was used to eliminate most broadleaved weeds. Moreover, plants of foxtail in flax after flax were larger, taller, tillered more and had longer inflorescences than foxtail plants in flax after oats, wheat, corn or soybeans; foxtail plants were smallest after oats.

The work here reported aimed to study the effect of a previous crop of corn, oats, wheat, soybeans, or flax on the populations of weeds, particularly smartweed, (*Polygonum persicaria* L.), growing in a flax crop.

METHODS

In plots at the Agricultural Experiment Station, Rosemount, Minnesota, corn, wheat, oats, flax and soybeans succeed each other in a predetermined way. These plots, which have been established for 10 years, are replicated 4 times, and each is 42 feet square. From the 20 plots from which data were taken, there were 4 replicated plots of flax following each of the 5 crops. From each replicate, 4 samples were harvested. Each sample included all of the plants from an area 10 feet by 6 inches, including the 2 rows of flax and the area between the rows. This gave an area of 5 square feet per sample. Thus data reported are based on from 100 to 700 smartweed plants depending upon the crop sequence.

The flax variety used was B-5128 and was sown on May 5. When the flax plants were about 6 inches tall (June 7) the following herbicides were applied: MCPA (sodium salt of 2-methyl-4-chlorophenoxy-

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acetic acid) at the rate of ¼ lb. acid per acre and TCA (sodium salt of trichloroacetic acid) at the rate of 5 lb. per acre.

Plants were harvested August 22. The following data were taken: height of flax and of smartweed, weight of smartweed, number of flax, smartweed and other weeds that make up the total plant population, and dry weight per plant.

RESULTS

Ladysthumb smartweed (*Polygonum persicaria* L.) was the weed in greatest abundance in flax. This weed comprised 46% of the weed population in flax after soybeans, 31% in flax after flax, 12% in flax after wheat or corn, and 9% in flax after oats. The flax population remained nearly constant following flax or any of the other four crops. Thus the smartweed population had no apparent effect on survival of flax plants.

Larger numbers of smartweed plants were found where the previous crop was flax or soybeans than where the previous crop was corn, wheat or oats, see Fig. 1. Also the dry weight per plant was greatest in flax after soybeans or flax, and less after corn, oats and wheat, in that order (Fig. 1).

Smartweed plants averaged 43 cm. in height in flax following flax and 41 cm. in flax following soybeans, and from 29 to 32 cm. in flax following corn, oats or wheat. Also smartweed plants had more branches in flax following flax or soybeans than in flax after any of the other 3 crops.

The amount of branching is not shown in data on height of smart-

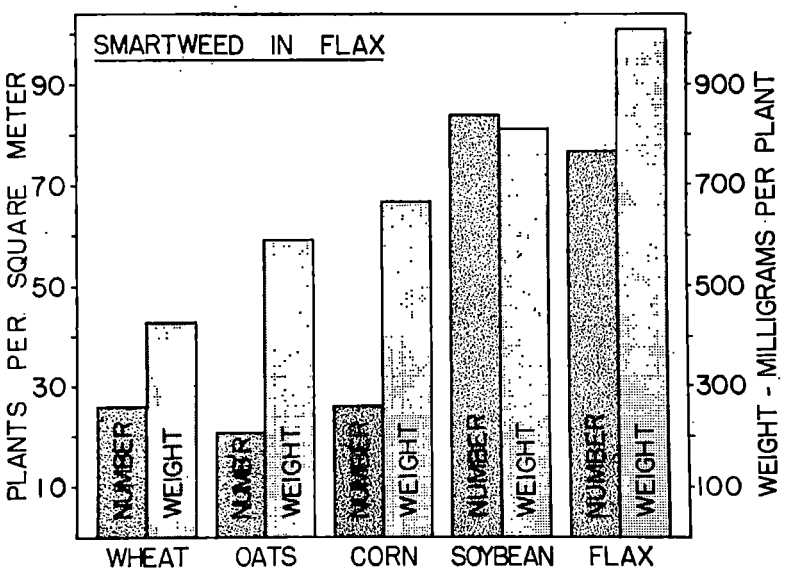

FIGURE 1. The effect of a preceding crop of wheat, oats, corn, soybeans, or flax on the number and dry weight of smartweed plants in flax.

weed plants. However when all the stems and branches were measured for length and the average length per smartweed plant was computed, it was found that smartweed plants averaged 65 cm. in flax after flax, 60 cm. in flax after soybeans, 43 cm. in flax after oats, 36 cm. in flax after corn and 33 cm. in flax after wheat.

DISCUSSION

Smartweed plants were more numerous in flax preceded by flax or soybeans than in flax preceded by corn, oats, or wheat. MCPA kills many broad-leaved weeds and TCA kills many graminaceous weeds, but smartweed is not killed by either. This may account for its predominance in flax in this year. In the earlier work where yellow foxtail was reported to be the predominant weed, no herbicide was used to kill the graminaceous weeds (Kommedahl and Linck, 1958). In the present tests smartweed predominated probably because it had little competition from other weeds, since most of these were killed by the two herbicides, and flax itself is not a good competitor with weeds.

Although smartweed plants comprised the highest percentage of the weed population in flax, the smartweed population apparently was not high enough to affect the survival of flax plants as there were fewer than 100 smartweed plants per square meter in any of the crop sequences. Nor was size of smartweed plants a factor. In the previous work where yellow foxtail was the predominant weed in flax (Kommedahl and Linck, 1958), there were from 300 to 600 foxtail plants per square meter, depending upon the crop sequence. In some instances there were fewer flax plants where the foxtail population was high. However, size of foxtail plants proved to be a greater factor than numbers of plants per unit area in affecting flax population. Thus the nature of the effect of the weed on the crop as affected by the preceding crop is not clear.

SUMMARY

There were 84 smartweed plants per square meter in flax after soybeans, 77 after flax, 26 after corn and wheat, and 21 after oats. Dry weight per smartweed plant was highest after flax (1,111 mg.) and less after other crops in the following order: soybeans (814 mg.), corn (671 mg.), oats (594 mg.), and wheat (429 mg.). Also smartweed plants in flax averaged at least 10 cm. taller after soybeans or flax than after corn, oats, or wheat. In general, data for smartweed plants in flax after flax and soybeans were similar, and were substantially higher than data obtained for plants in flax after corn, oats, or wheat.

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