Oats have generally been classified as being relatively tolerant to 2,4-D. However, the application of 2,4-D has caused injury to this crop in many instances. Oats have proven to be more susceptible to 2,4-D at certain stages of growth than at others (9, 11, 15, 16, 17, 19) and some varieties appeared to be more susceptible to 2,4-D (3, 7, 9, 13, 14) or MCP (11) than others. Although most of these findings have been based on yield alone, it has been shown that reduced yield is accompanied by a decreased number of seeds, fewer flowering culms, fewer fertile florets or reduced seed-weight (1, 2, 16) as well as such abnormalities as onion-like leaves (8, 10, 20) two panicles from one stem (7), sterile florets (15, 16, 19) “non-split” glumes (1), partially decayed roots (19), lodging (6, 10, 20) and reduced straw strength (12). In some cases (2, 14, 15, 17) reduced yield and quality of grain have also been accompanied by impaired viability. However, it has been shown in barley (4) that reduced yield and malformations were not transmitted to the succeeding generation.

The purpose of this study was to determine whether oat varieties, economically important to South Dakota, gave a differential response to 2,4-D treatment and to determine whether yield reduction was transmitted to the progeny.

Materials and Methods

Nine varieties—Brunker, Trojan, Mindo, Tama, Clinton, Bonda and Marion—were treated in 1947 and 1949. Andrew was added to the test in 1948. Formulations of a butyl ester, an alkanol amine and a sodium salt of 2,4-D, at a rate of 1 pound active ingredient per acre, were compared with “no treatment” at the five-leaf, tillered, heading, and milk stages of growth. The area used in 1947 was uniformly covered with field bindweed (Convolvulus arvensis L.) with an average stand of 12 to 18 plants per square yard. A split-split-plot design was used each year with stages of growth as whole, plots, treatments as subplots and varieties in sub-subplots.

Three of the stages of growth treated are shown in figure 1. The five-leaf stage of growth was treated when the plants were between the 5th-leaf-emerging and 5th-leaf-expanded stages. The fully tillered stage was treated when plants were 12 inches tall the first 2 years but rainy weather delayed this treatment in 1949 until the plants were 18 to 20 inches tall to tip of outstretched leaf. The heading stage was treated when between 20 and 50% of the panicles had emerged, while the milk stage was treated when early varieties were approaching the soft dough stage.

Yield, seed-weight and viability data were determined all 3 years, and the number of panicles per foot of plot and number of seeds per panicle were determined in 1949. All data were subjected to an analysis of variance statistical treatment.

The second study was conducted to determine whether decreased yield was transmitted to the progeny of the varieties tested in the variety study. Grain from treated plots and from untreated plots was saved from all varieties grown in 1949 and was planted in 1950 in a split-plot design replicated six times. Yields were determined and data were analyzed statistically.

Results and Discussion

Variatel responses were measured in terms of certain components of yield, seed viability, malformations and effect on progeny.