Effects of Varying Rates of 2,4-D and 2,4,5-T at Different Stages of Growth on Winter Wheat

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Selective post-emergence spraying of cereal crops for control of certain broad leaved weeds is now widely adopted. Winter wheat is as tolerant as any of the cereals to the herbicides commonly used for selective spraying but is sometimes injured to some extent by the chemicals. Wheat plants in certain stages of growth are injured more than at others and the amounts of chemical tolerated vary. Yield of grain is the most usual measure of the effect of herbicides but other measurements are of importance. This study summarizes three seasons of investigations in which a number of these factors were taken into consideration in weed-free winter wheat.

LITERATURE REVIEW

Considerable literature has accumulated on the effects of 2,4-D (2,4-dichlorophenoxyacetic acid) on wheat. Although results vary, some trends are apparent. Many investigators report reduction of grain yields due to 2,4-D treatment at one or more stages of growth (1, 3, 4, 7, 8, 9, 11, 14, 19, 20, 21, 24, 26, 27, 28, 29). There are also many reports in which the yield differences are not significantly influenced by treatment (1, 3, 4, 5, 10, 13, 15, 16, 17, 18, 25, 26). Such failures to obtain significant reductions are often due to one or more causes: (a) use of low rates of application which often give injury of less magnitude than usual experimental errors, (b) use of a low number of replications or other factors resulting in high experimental errors, (c) treatment at relatively tolerant stages of growth, (d) compensating effects in weedy wheat of weed control by 2,4-D treatments, or (e) drought, disease, insect damage or other causes which tend to give low yields and make the plants more tolerant to 2,4-D or to nullify its effects.

Wheat plants in certain stages of growth are more subject to injury than others. The literature cited above indicates some of these stages. Olson, et al. (14) summarize the literature as follows: "most of the literature cited reported damage to wheat, oats and barley in early growth stages, , , , especially where an ester of 2,4-D was used. Several reported damage to (sic) later stages. These ranged from 12 inches in height through boot, early heading, and early post-heading stages. Many of the results from treatments at later stages were inconsistent."

In addition to effects on yield, growth abnormalities, sterility and other changes have often occurred. Erickson, et al., (6) first reported that 2,4-D treatment caused changes in protein content of the grain. Many workers since have published data indicating that such changes, when they occurred, were inversely related to yield (2, 7, 9, 12, 21, 22, 23), but when yields were not changed by treatments the protein content was not significantly influenced by 2,4-D treatment (11, 15, 25).

MATERIALS AND METHODS

Fourteen inch spaced drill rows of Pawnee wheat were divided into four row plots, 12 feet long. A split plot design with stage of growth as main plots, and rates of spray materials as subplots, replicated six times was used for the stage of growth and rate of application study. Acid equivalent treatments of 0, 1/8, 1/4, 1/2, 1, 2 pounds 2,4-D ester, 1/2 and 1 pound 2,4-D amine and 1 pound 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) ester per acre were applied in 1948 and 1949; in 1950 the 1/8 pound 2,4-D ester and 1 pound 2,4,5-T ester were omitted. Four dates of application and stages of growth were as follows:

Jointing—April 27, 1948 (9–12 in. tall); May 7, 1949 (16 in. tall—5 leaves per tiller); and May 1, 1950 (8–10 in. tall).