Effect of Spacing in Winter Versus Spring Grain Companion Crops and Its Relation to Nitrogen Fertilization of the Winter Type

Clinton R. Blackmon and Robert S. Snell

SEEDING rates and spacings of small grains in relation to grain and forage yields have been investigated in the Midwest and Southern Great Plains (1, 2, 4, 6, 7). Although the results have varied, close spacings generally have given better grain yields but less forage. Applications of nitrogen fertilizer have usually given significantly higher grain and forage yields (3, 5).

The present study was organized to determine the effect of 7-, alternate 7- and 14-, and 14-inch spacings on winter grain and the associated red clover-timothy forage. Preliminary research during the 1949 and 1950 seasons had indicated a better grain yield at 7- than at 14-inch spacings but better forage establishment at 14 inches. As originally outlined, the study sought to relate spacing to fertilizer practice, but due to difficulty in establishing the desired levels of phosphorus and potassium within the period of the study, the relationship has been limited to nitrogen fertilization.

To determine the effect of spacing on spring grains, oats were grown as a companion crop to alfalfa in 1951, 1952; and 1953. The same three spacings were used with the spring oats as with the winter wheat. Uniform applications of fertilizer were made.

METHODS AND MATERIALS

Winter grain.—Thorne wheat was seeded in replicated plots with 7-, alternate 7- and 14-, and 14-inch spacings between rows. Every other opening on a 7-inch grain drill was closed to get the 14-inch row spacings and every third opening closed to get the alternate spacing. The drill was set at the rate of 2 bushels per acre for all plots. This setting gave 2, 1-1/3, and 1 bushel per acre for 7-, alternate 7- and 14-, and 14-inch spacings, respectively. The grain was planted on Oct. 15, 1951 and Sept. 29, 1952.

Timothy was seeded with the wheat at the rate of 6 pounds per acre. Kenland red clover was broadcast at 8 pounds per acre on frozen ground the following March using a wheelbarrow seeder.

Fall applications of ammonium sulfate were made at the rates of 20 and 40 pounds of nitrogen per acre with the seeding. Spring applications of 30 pounds of nitrogen per acre in the form of sodium nitrate were broadcast over one-half of each plot in the spring of each season.

All plots were grown in a rotation of corn, spring grain, winter grain and forage crop. The soil type was Nixon sandy loam.

Spring grain.—Clinton oats were seeded in 1951, 1952, and 1953 at the drill setting of 9 pecks per acre. This gave 9, 6, and 4½ pecks per acre for 7-, alternate 7- and 14-, and 14-inch spacings, respectively. Buffalo alfalfa was seeded with the oats at the rate of 12 pounds per acre. The drill had been adapted to band seeding by fastening the grass seed tubes, extended by means of lengths of garden hose, about 6 inches behind the disk furrow openers. Fertilizer was applied at the rate of 500 pounds per acre of 5-10-10 broadcast and 500 pounds of 4-12-8 drilled with the grain.

RESULTS

32.5 bushels per acre from the 7-inch or topdressing.-Table 1 indicates that topdressing the grain with sodium nitrate at the rate of 30 pounds of nitrogen per acre significantly increased grain yields at all spacings. The average increase in 1952 was 5.8, and 7.1 bushels per acre at 7-, 14-, and 14-inch spacing, respectively. The addition of nitrate increased the average yield 8.5 bushels but 2.2 bushels. In 1953 the effect of the topdressing was reduced by heavy spring rains which caused severe leaching. The use of nitrate in 1953 increased average head heights 5.8, and 7.1 bushels per acre at 7-, 14-, and 14-inch spacings, respectively. The addition of nitrate topdressing decreased the red clover stands 17% at the alternate, and 18% at the 14-inch spacing, respectively. It can be seen from table 2 that the addition of nitrate topdressing decreased the red clover stands 17% at the alternate, and 13% at the 14-inch spacing. These reductions are significant.

Spring Oats

Table 4 shows that spring oats yields increased with wider spacing in the 1951, 1952 and 1953 seasons. The 3-year average yields were 46.5, 35.2, and 32.5 bushels per acre at the 7-, alternate 7- and 14-inch spacings, respectively. It can be seen from table 4 that yields from the narrowest to the widest spacing were increased from 2,562, and 1,986 pounds per acre, corresponding head counts per unit of row.

The same table shows the average number of red clover counts per unit of row were 2,562, and 1,986 pounds per acre, corresponding head counts per unit of row.

The same table shows the average number of red clover counts per unit of row.