Dr. Alan D. Blaylock

Starters With Zinc Increase Bean Yields

Wyoming studies also show yields increase and plants mature more quickly with later plantings.

Summary: *The dry edible bean is an important crop in many northern states. Early planted beans generally exhibit slow early growth that may he related to reduced nutrient availability. A study was conducted at Powell, Wyoming, to determine optimum planting time for dry beans and the potential of starter -fertilizers to improve growth and yield of early-planted beans. Two varieties were planted on May 10, 20, and 31, and on June 10. Treatments were no starter (control), broadcast and band Early thy matter production was sign ificantly increased by starters. Crops treated with N-P-Zn starter produced yields averaging 300 lbs/A greater than those in control plots. Yields increased with later planting, but response to starters was consistent among planting dates. Later plantings matured more quickly than early plantings, but more rapid maturity rate did not make up for planting delay. Maturity differences among starter treatments were statistically significant hut too small to he of practical importance.*

The dry edible bean is an important crop in Wyoming, but is one that should be planted in warm soils after danger of frost is past. The short growing season in Wyoming, with its cool summers, is barely adequate for many dry-bean varieties. Producers have observed that beans planted early in cool soils do not always mature earlier than beans planted later in warm soils.

In recent years, early fall frosts and unusually cool summers have resulted in significant crop losses and focused attention on implementing practices that promote earlier maturity. Previous research at Powell, Wyoming, has shown that zinc applications can hasten bean maturity, even where soil zinc is adequate and yield responses are not normally observed. Preliminary research has also indicated the potential of starter fertilizers to improve bean production, and promote earlier maturity. Starters, however, are not widely used in our area.

In order to determine the optimum planting time for dry beans and the potential of starter fertilizers to improve growth and yield and hasten maturity of early planted dry beans, a study was ini-tiated at our Research and Extension Center at Powell, Wyoming.

Delayed planting helps

Warm, dry summer weather resulted in conditions generally favorable for bean production. Warm weather in September and unusually late frost allowed all beans, regardless of planting date, to completely mature. Yields were good to excellent for the area.

Variety and planting date yields are shown in Figure 1. In contrast to 1993, yields increased with later planting. Variety Bill Z yields were significantly greater than the Midland navy variety for all planting dates. Bill Z plants were larger at V4 for all planting dates, but by flowering, Midland plants tended to be greater.

Yields from the May 10 planting were less than expected under the weather conditions that prevailed. Wet conditions in late April delayed field preparation, and irrigation did not follow until immediately after planting. This created cold, wet soil conditions during germination and seedling development, which was probably related to the conditions created by irrigation. These conditions probably also affected yield, but they give a good indication of plant response to early planting when conditions are unfavorable.

Irrigating after planting also probably contributed to a greater incidence of Fusarium root rot, a common bean disease in the area. Disease symptoms were scattered throughout the plot area, but seemed most severe where planting occurred on May 10. Hot, dry winds in late June and early July seemed to cause some flower abortion in areas of May 10 planting, but no data were

Table 1. Fertilizer source for dry-bean treatmrnts at Powell, Wyoming, Blaylock, 1994.

Source				
N rate	P rate	Zn rate	Treatment	Materials used
lbs/A				
20	0	0	band	32-0-0
20	20	0	band	10-34-0 + 32-0-0
20	20	1	band	10-34-0 + 13-0-0-15Zn[1] + 32-0-0
20	20	1	broadcast	34-0-0 + 0-46-0 + $ZnSO_4$

[1] Ammoniated Zn-ammine complex

collected to verify this observation. The combination of cold, wet soil early,

Fusarium root rot, and hot, dry winds during flowering is the likely cause of lower yields in this planting.

Starters boost yields

Starter fertilizer treatments significantly affected early growth and final yield. There were significant yield increases with 20 lbs/A of N with starter alone, plus further incremental increases with the addition of P and Zn to the starter (Figure 2).

Highest yields were produced with the combined N-P-Zn starter, but there was no response to the same nutrient combination when it was broadcast before planting. Early dry matter was primarily a response to starter N, because differences among banded starter treatments were relatively small compared with the response to the N starter alone. Yield responses to starters in this study occurred in spite of ade-quate soil test P and Zn levels. Although R8 dry matter was not significantly affected by fertilizer, larger plants early in the season seemed to relate to greater yields.

Development/maturity impact

Planting date. Similar to 1993 studies, days from planting to flowering, flowering to maturity, and planting to maturity decreased with later planting date. Differences in days-to-flowering were a result of a more rapid emergence and not a difference in days from emergence to flowering. Maturity differences observed in response to planting date were accounted for by differences in emergence time and days from flowering to maturity. Data indicated that later planting favors more rapid plant growth and development, but not enough to make up for differences in planting time. In most years in northern Wyoming, beans planted on June 10 would not be expected to mature and produce a harvestable crop.

Fertilization. Maturity was signifi-cantly affected by fertilizer treatments, but mean differences were one day or less. Although statistically significant, these differences would be considered negligible under normal field practices. In previous research, Zn

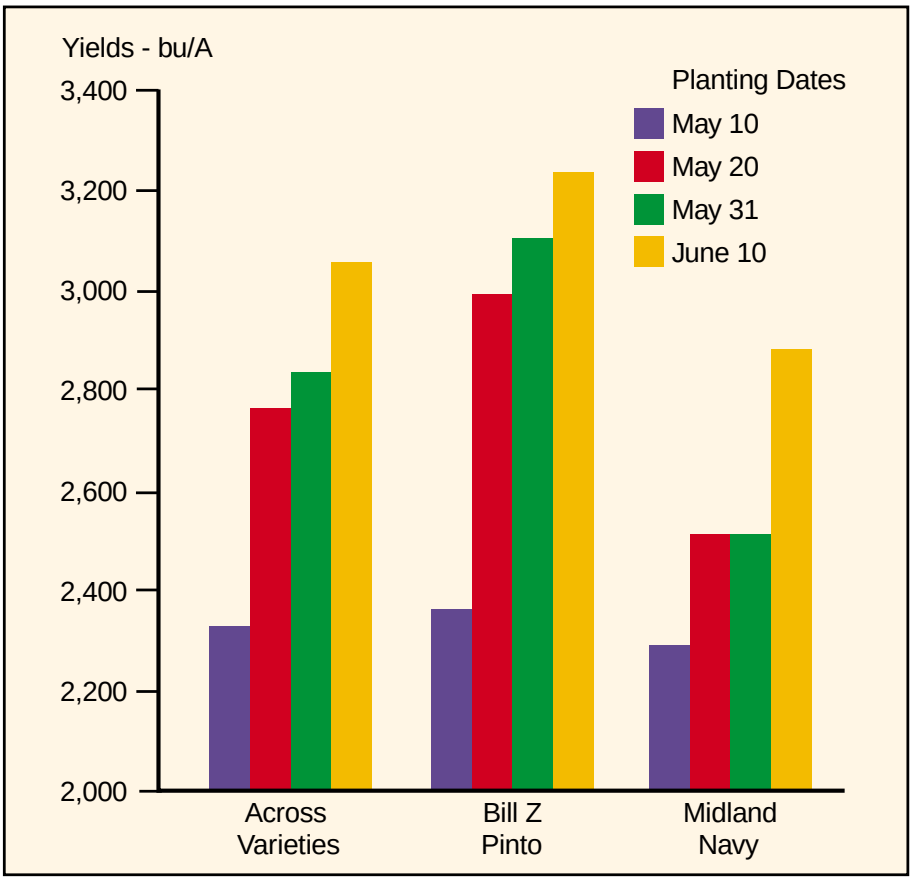

Figure 1. Yield response of dry-bean varieties to planting date at Powell, Wyoming, Blaylock, 1994.

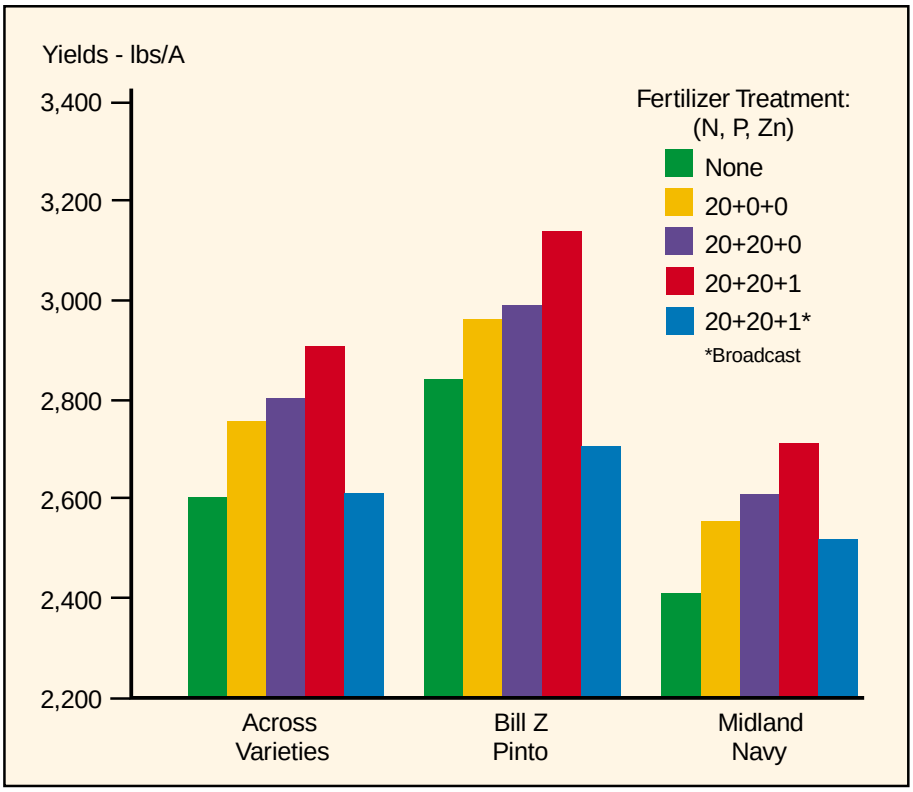

Figure 2. Effect of fertilizer source on dry-bean yields at Powell, Wyoming, Blaylock, 1994.

applications have consistently hastened maturity, even in the absence of yield response. This was not observed in the 1994 study.

In 1994, soil test Zn was higher than in 1993 and soil temperatures were gener-ally warmer throughout the season than in previous years. Availability of soil Zn may have been adequate to supply plant needs late in the season. Also, Zn appli-cation rate in previous work was 5 lbs/A versus 1 lb/A in 1994.

Procedure

Plot. The study was conducted in a randomized complete block design with a split-strip-plot arrangement of treatments. Plots were 11 feet wide and 35 feet long.

Fertilization. Treatments and fertilizer materials used are shown in Table 1. For liquid treatments, water was added to the fertilizer materials listed in Table I in order to bring the volume applied to 30 gal/A for better application accuracy. Banded fertilizers were knifed-in two inches from the plant row and two inches below the seed immediately before planting.

Soil. Soil was a Garland clay loam (fine, mixed, mesic Typic Haplargid). The soil was prepared by fall plowing and roller harrowing in 1993, and roller harrowing and leveling in March 1994.

Previous crop was malting barley.

Soil samples. Soil samples were taken April 15 to depths of 0 to 6 inches, and 6 to 12 inches.

Irrigation. Because winter and spring precipitation in the area is limited and unreliable, irrigation is necessary for satisfactory germination. Each planting date treatment was irrigated about two weeks before planting, except the May 10 planting. In 1994, wet conditions in late April prevented timely soil preparation and pre-irrigation of the May 10 planting. This treatment was irrigated immediately after planting. Beans were irrigated five to seven times at seven- to ten-day intervals, as required during the growing season.

Weed control. Bentazon (Basagran) and sethoxydim (Poast) were applied as needed for postemergence weed control. Beans were cultivated as necessary for weed control, and to clean irrigation rows.

Dr. Blaylock is assistant professor at the University of Wyoming, Powell Research and Extension Center