# Effects of Phosphorus on Crop Maturity

The influence of P on crop maturity has been observed by many researchers on a variety of crops.

A five-year Ohio State University study showed that raising soil test P from low to high increased corn yield 8 bu/A and decreased grain moisture at harvest by 1.3 percentage points. Placement of P can also influence early growth, with effects often carrying through to earlier maturity. In Indiana, banding 80 lb/A $P_2O_5$ resulted in a 15 bu/A corn yield increase over broadcast application and 1.5 percentage points less moisture in the grain at harvest.

Recent no-till research in Kansas showed that starter containing P increased yields of responsive hybrids of corn by 17 bu/A and responsive grain sorghum hybrids by 14 bu/A (**Table 1**). Days to midsilking or midbloom were significantly reduced, and grain moisture at harvest was lowered several percentage points.

Researchers in Illinois found that earlier corn silking and lower moisture contents were associated with P fertilization and increased soil test P levels. **Table 2** shows the effects on silking, as measured by degree-days.

The influence of phosphorus (P) on crop maturity is often an added bonus to its effect on increasing yields. For example, early maturing fruits and vegetables almost always command a premium in the marketplace. In multiple cropping, a few extra days can mean a significant difference in the relative success of the system. A reduction in grain moisture at harvest can also lead to savings in drying costs per bushel.

In Alabama research, there was a maturity advantage for in-row starter containing P compared to beside-the-row application on grain sorghum. Both advanced maturity over the zero starter treatment. Seed-placed phosphate, applied at the rate of 40 lb/A $P_2O_5$, hastened grain sorghum maturity an average of four days at nine locations in the Texas Blacklands. Seedlings had more vigor, and the rapid early growth made it possible to cultivate earlier, resulting in better mechanical weed control. Results are shown in **Figure 1**.

In-row starter fertilizer containing P (3 to 5 gal/A of 11-37-0 or 10-34-0) can

**TABLE 1.** Starter fertilizer and hybrid effect on corn and sorghum maturity and grain moisture content.

| Hybrid type | Number of hybrids | Grain yield response, bu/A | Reduction in: Days to midsilk/bloom | Reduction in: Grain moisture, % points |
|---|---|---|---|---|
| Corn | | | | |
| responsive | 7 | 17 | 5.7 | 3.8 |
| non-responsive | 5 | 0 | 0 | 0 |
| Sorghum | | | | |
| responsive | 8 | 14 | 5.4 | 5.5 |
| non-responsive | 4 | 4 | 1.0 | -0.1 |

Kansas; 3-yr average

**TABLE 2.** Effect of $P_2O_5$ on degree-days (F) between corn emergence and silking.

| $P_2O_5$ applied, lb/A | P soil test levels, ppm[1] | Degree-days (F) between emergence and silking: Early planted | Late planted |
|---|---|---|---|
| 0 | 25 | 1,482 | 1,446 |
| 20 | 40 | 1,398 | 1,419 |
| 100 | 132 | 1,398 | 1,356 |

[1]ppm = parts per million

be beneficial even on soils testing high in P. In a 6-year Louisiana study, corn yields following cotton were increased with starter P by an average of 8 bu/A, time to midsilking was decreased by four days, and grain moisture at harvest was lowered from 18.9 to 17.9 percent.

## Small Grains

Research in Oklahoma has shown that P speeds maturity of wheat by as much as four to seven days. Similar results have been observed in Kansas and Texas. Drilling P with the seed at planting advanced the maturity of spring wheat in North Dakota, **Figure 2**. In New York, late-planted wheat and barley ran 6 percent higher in moisture without P fertilization at the time the P fertilized plots were ready to harvest.

In a Louisiana study, P fertilization hastened grain maturity and yield immediately after rice and one year following rice, **Table 3**.

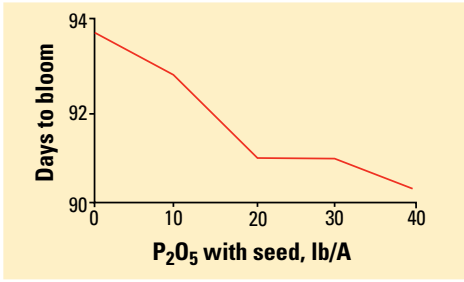


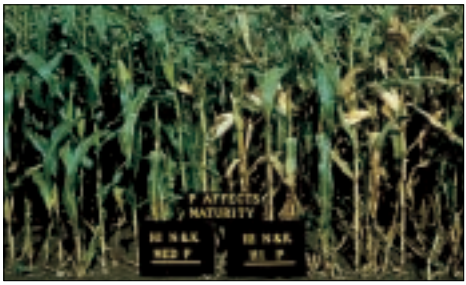

**Figure 1.** Effects of P applied with seed on maturity of grain sorghum.

**TABLE 3.** Influence of P fertilization on wheat grain maturity and grain yield.

| | Wheat immediately following rice | | Wheat one year after rice | |
|---|---|---|---|---|
| $P_2O_5$, lb/A | Days to maturity | Relative yield, % | Days to maturity | Relative yield, % |
| 0 | 151 | 68 | 150 | 79 |
| 25 | 150 | 86 | 149 | 86 |
| 50 | 149 | 97 | 148 | 93 |
| 100 | 148 | 100 | 147 | 100 |

## Cotton

Phosphorus fertilization hastened cotton maturity by increasing yield of the first picking and total seedcotton yield at several locations in Arkansas. Research in Tennessee showed that P fertilization increases yield, hastens maturity, and results in a higher proportion of the total yield in the first picking. Balanced P and K fertilization provided the greatest proportion of total cotton in the first harvest, **Table 4**. In Alabama, starter fertilizer containing P increased early season plant height by 14 percent over the no starter treatment and boosted yields at the first picking by 4 to 5 percent.




**Research indicates** that earlier corn silking and lower moisture content are associated with P fertilization and increased soil P levels.

## Vegetables

Canadian researchers found that P fertilization advanced the maturity of green peas. Maturity of cauliflower was slightly delayed by a lack of P. In Texas, fertilizer

*(continued on page 19)*

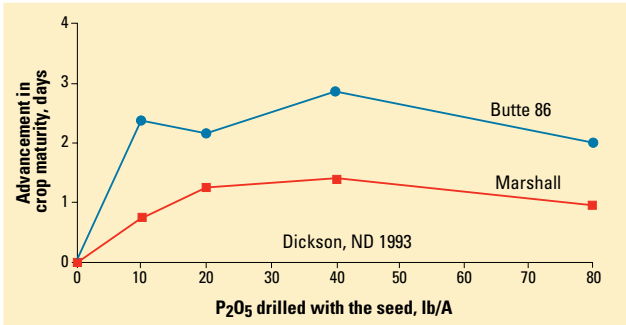



**Figure 2.** Effect of drilled P and variety on spring wheat development in North Dakota.

ammonium phosphate (UAP) show few consistent differences. At high rates, DAP can cause germination damage when placed in direct seed contact on alkaline soils, due to the release of some free ammonia. Limited rates of application control the problem. Formulations of UAP have an even greater probability of germination damage in direct seed contact due to ammonia release from urea hydrolysis. Application rates of UAP in seed contact should be lower than DAP. While APP provides some superior physical characteristics in liquid fertilizers, agronomic capabilities of MAP, DAP, APP, and UAP are essentially equal.

- **Physical form of phosphorus fertilizers.** Solid and fluid forms of P involve the same compounds mentioned earlier. Agronomic capabilities of solid and fluid P sources are essentially equal. Handling differences, adaptability to methods of application, and abilities to co-apply micronutrients as well as pesticides are valid management considerations when evaluating P fertilizers.
- **Phosphorus placement.** Placement can have tremendous effects on crop responses to applied P. For more information on placement, see the article beginning on page 34. BC

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**TABLE 4.** Balanced P and K increase proportion of cotton in first picking (Tennessee).

| $P_2O_5$, lb/A | $K_2O$, lb/A 0 | 30 | 60 |
|---|---|---|---|
| | % cotton in first picking | | |
| 0 | 65 | 71 | 74 |
| 40 | 77 | 77 | 77 |
| 80 | 78 | 78 | 78 |
| 120 | 78 | 81 | 79 |

P hastened first bloom in tomatoes by as much as 10 days or more. Broadcast treatments were less effective in promoting early bloom, **Figure 3**. BC

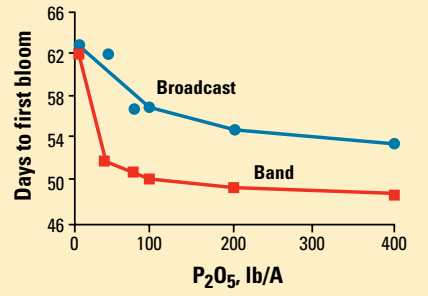


**Figure 3.** Influence of P rate and placement on time to first bloom of tomato plants.

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