Michigan Winter Wheat Management: Spring N Application Timing

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As the signs of spring begin to point towards the start of another growing season, many Michigan producers are starting to think wheat. Many spring management decisions are highly dependent on the condition of the wheat crop coming out of dormancy but one question that often arises is nitrogen (N) application timing. Nitrogen strategies must address two questions: 1) can N be delivered to the plant in a timely fashion? and 2) can the opportunities for N loss be reduced without affecting N delivery to the plant?

Although 60% of wheat N uptake occurs between Feekes 4 – 10.1 (i.e., stem elongation through head emergence), many Michigan producers will apply the bulk of their N in one or two applications in between Feekes 2/3 – 5 (i.e., tillering and spring growth through just prior to first node). The time interval between growth stages will greatly depend on soil temperatures and weather conditions. However if wheat had a timely autumn planting date and was able to accumulate a sufficient number of growing degree days (GDDs) to effectively tiller (2-3 tillers per plant), many times spring N applications can be delayed until near or soon after Feekes 5. If wheat was planted late autumn or was not able to accumulate GDDs to effectively tiller, spring N applications are often applied earlier to stimulate plant tillering.

Table 1. The impact of three spring N application timings (green-up, Feekes 5, and a 50/50 split between green-up and Feekes 5) on Michigan soft red winter wheat grain yield, 2013-2016, Lansing, MI.

Year	N Application Timing		
	Green-Up	Feekes 5	Green-Up/Feekes 5
	----------Wheat Grain Yield (bu/A) ---------		
2013	83 a†	95 b	92 ab
2014	97 a	97 a	94 a
2015	109 a	109 a	110 a
2016	91 a	90 a	91 a

† Means in the same row followed by the same letters for each year are not significantly different at $P \leq 0.10$.

In sufficiently tillered wheat fields, N timing decisions may be based on spring weather conditions. In wet spring seasons, split or delayed N applications will often result in a positive grain yield response while drier spring weather conditions may often result in poor use or uptake of the split or delayed N application. The influence of spring N application timing on grain yield from 2013-2016 is presented in Table 1. A delayed or split N application significantly affected grain yield in only one out of the last four growing seasons (2013) at this location. April

precipitation totals for the 2013 through 2016 growing seasons measured 7.0, 0.9, 0.8, and 2.9 inches, respectively. The precipitation totals likely serve as an indicator as to why the Feekes 5 timing yielded greater than the green-up application in 2013, that is the opportunities for N loss were reduced by avoiding the intense April rainfall period. Technologies including enhanced efficiency fertilizers (EEFs) can buffer some of the uncertainty with spring wheat N application timing by reducing nutrient losses and increasing plant nutrient availability. Results evaluating EEFs in Michigan soft red winter wheat as well as other soil fertility and nutrient management field study results are available at soil.msu.edu.

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