Bokashi as An Organic Fertilizer Alternative For Winter Wheat

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Introduction

- Area of organic wheat production has consistently increased from 38,907 ha in 1995 to 112,343 ha in 2005. (Greene 2009)
- Organic wheat represented 16.1% of total organic US cropland. (Greene 2009)
- Bokashi uses readily available materials to produce an organic source of N.
- Bokashi using effective microorganisms is able to be produced in a short period of time.

Materials and Methods

Preparation of EM Bokashi

- Bokashi was produced adapting the methodology of Yamada and Hui-Lian (Yamada and Xu, 2001).
- The stock solution contains the following volume ratio of materials 1:1:100; EM: molasses: water;). The molasses was used to activate the EM. All the materials were mixed and placed in a closed container for 7 days. Yamada and Hui-Lian (2001) used rapeseed oil cake and rice bran but they were not easy to acquire, so they were replaced by soycake and wheat bran. (Table 1) Bokashi rates where calibrated to match those of NO_3NH_4. After 7 days the material produced a sweet and sour smell that Nishio (1999) said indicated product readiness. The material was air dried for 24 h. By that time it reached 8% moisture so it was easy to handle using manual spreaders.

Field Experiment

The experimental design consisted of seven treatments allocated in a randomized complete block design with four replications. Field-grown wheat (near Lexington, KY in 2008-09) was treated at Feekes' stage 3 (mid-March) with 34, 67 and 102 kg N ha^{-1} of bokashi and 34, 67 and 102 kg N ha^{-1} for NO_3NH_4 plus a control 0 lb/A. Plots were 1.22 m wide by 3 m long, with a row spacing of 0.17 cm between plants using a 7 row planter. The seedling rate was 35 viable seeds m^{-2}. (All N fertilization was placed at Feekes stage 3). Weekly chlorophyll readings were taken using a Sharp ™ SPADMETER every week from April 21 until June 5. The experiment was harvested on June 23.

Material	Amount (kg)	%
Wheat bran	2.7	33.2
Soy cake	1	12.3
Fish meal	1	12.3
Zeolite	1	12.3
Stock solution	2.44	30.0

Table 1. Materials used in bokashi preparation

Figure 1. Bokashi study near Lexington, KY

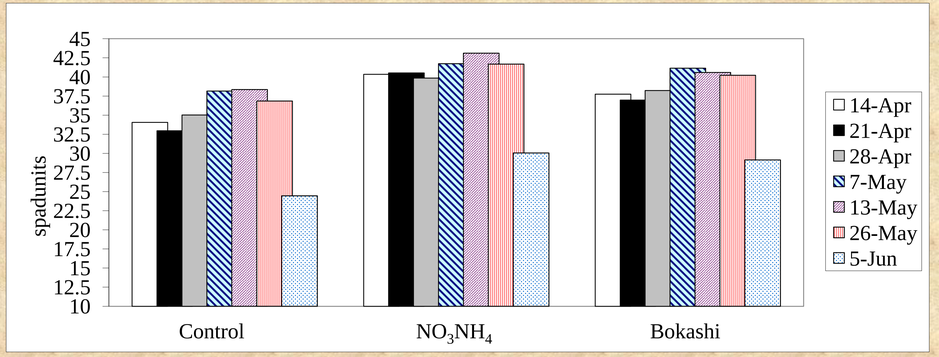

Table 3. Effect of the N sources on wheat spad readings from April 21 until June 5

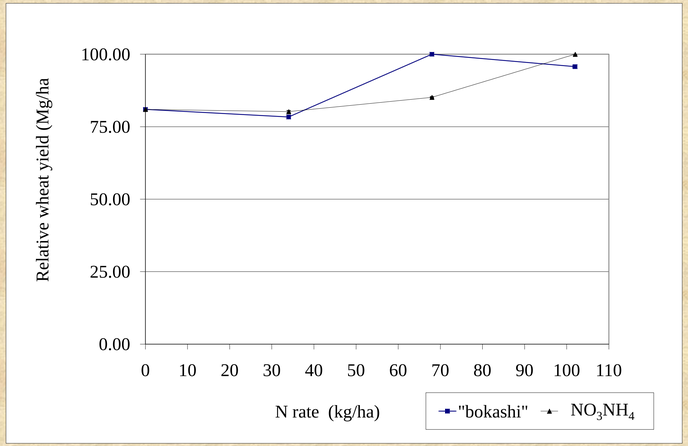

Table 2. Effect of 4 rates of bokashi and NO_3NH_4 (0, 34, 67, 100 kg/ha) on relative wheat yield in central KY, 2009

Results and Conclusions

Bokashi is a slow mineralization N source and its best response for yield occurs at 68 kg N/ha with 2.5 Mg/ha. The chlorophyll readings show that bokashi is different than NO_3NH_4 in terms of spad units, with NO_3NH_4 being superior to bokashi until May 7. However from June 5, bokashi and NO_3NH_4 are not different in terms of spad units which could help the plant to translocate N to grain filling at the end of the cycle. Bokashi may hold promise as an organic N source for winter wheat.

References

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- Yamada K., Xu H. (2001) Properties and applications of an organic fertilizer inoculated with effective microorganisms. Journal of Crop Production 3:255-268.