# EVALUATION OF NON-CONVENTIONAL ADDITIVES FOR ONION PRODUCTION

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## Summary

Eleven non-conventional additives from eight companies were tested for their effect on onion yield and quality, and for their economic efficiency. None of the products tested increased onion yield or quality compared to the untreated check.

## Introduction

Numerous non-conventional additives are being marketed. Growers need information on onion yield and quality responses to these products and their cost effectiveness.

## Methods

The trial was conducted on an Owyhee silt loam with 1.4 percent organic matter and a pH of 7.4. The field previously had been planted to wheat. In the fall, before plowing, 100 lb $P_2O_5$/acre and 20 lb N/acre were broadcast. The wheat stubble was shredded, and the field was deep-chiseled, disked, irrigated, moldboard-plowed, roller-harrowed, fumigated with Telone C-17 at 24 gal ai/acre, and bedded.

Beds were knocked down March 16. Onion seed (cv Vision, Petoseed, Payette, ID) was planted April 7 at 153,000 seeds/acre in double rows on beds spaced 22 in apart. The onion rows received 3.7 oz of Lorsban 15G per 1,000 ft of row (0.82 lb ai/acre), and the soil surface was rolled.

Plots were 27 ft long and four double rows wide. On May 17, alleys 4 ft wide were cut between plots, leaving plots 23 ft long.

Eight companies entered treatments that consisted of single products or combinations of products. The humic acid products tested and their application modes are listed in Table 1. The products were applied using the equipment listed in Table 2. The experimental design was a randomized complete block with treatments replicated six times.

Table 2. Equipment used to apply non-conventional additives. Malheur Experiment Station, Ontario, Oregon, 1999

| Application mode | Equipment specifications |
|---|---|
| 10-in band pre-plant | backpack sprayer at 20 gal/acre, 30 PSI, 8001 even nozzles |
| Broadcast pre-plant - liquid | double application with backpack sprayer at 50 gal/acre, 30 PSI, 8004 nozzles |
| Broadcast pre-plant - dry | hand fertilizer spreader |
| In seed furrow | Ridomil applicator at 24 gal/acre |
| Sidedress | sidedressed as Uran to both sides of bed at 60 gal/acre. Products were mixed with Uran. |
| Foliar | backpack sprayer at 16 gal/acre with 8002 nozzles |

All treatments were sidedressed on June 7 and again on June 23 with 100 lb N/acre as Uran, except treatments 6 and 11. Treatment 6 (Humizyme) did not receive any Uran. Treatment 11 (Kozgro) received 75 lb N/acre at the first sidedressing and 100 lb N/acre at the second sidedressing.

The trial was managed to avoid yield reductions from weeds, pests, and diseases. Weeds were controlled with cultivations on May 13, May 27, and June 17, and with low-rate herbicide applications as needed until lay-by (Table 1). After lay-by, the field was hand weeded as necessary. Thrips were controlled with four aerial applications of Warrior and Lannate. A brown wheat mite infestation in early August was controlled by Microthiol Special at 8 lb ai/acre.

Table 3. Herbicides and quantities (ai/acre) applied after onion emergence. Malheur Experiment Station, Ontario, Oregon, 1999.

| Date | Herbicides |
|---|---|
| April 30 | Buctril 3.3 oz |
| May 10 | Buctril 3.3 oz, Poast 3.6 oz |
| May 22 | Goal 1.2 oz, Buctril 3.3 oz, Poast 2.9 oz |
| June 2 | Goal 1.2 oz, Buctril 3.3 oz, Poast 2.9 oz, Prowl 0.45 pint |
| June 17 | Goal 1.2 oz, Prowl 0.9 pint |

The trial was furrow irrigated as necessary. Soil water potential was monitored by eight granular matrix sensors (GMS, Watermark Soil Moisture Sensors Model 200SS, Irrometer Co., Riverside, CA) installed below the onion row at 8-in depth on June 7. Thereafter, the field was irrigated to maintain soil water potential at 8 in depth above -20 kPa until the last irrigation on August 23.

The onions were lifted on September 17 to field dry. Onions from the middle two rows of every plot were topped by hand on September 28 and placed into storage in wooden crates on September 30. Onions were graded out of storage November 30, 1999. Bulbs were separated according to quality: bulbs without blemishes (No. 1s), split bulbs (No. 2s), neck rot (bulbs infected with the fungus *Botrytis allii* in the neck or side), plate rot (bulbs infected with the fungus *Fusarium oxysporum*), black mold (bulbs infected with the fungus *Aspergillus niger*), and bulbs with translucent rings. The No. 1 bulbs were graded according to diameter: small (< 2¼ in), medium (2¼ to 3 in), jumbo (3 to 4 in), and colossal (4 in and larger).

Onion production costs were based on data prepared by the Malheur County Extension Service. All onion production costs were the same for all treatments except loading and hauling, bin rental and storage, and grower assessments, which were based on a fee per hundredweight of total yield. Onion production costs for treatment 6 did not include N fertilizer. Onion production costs for treatment 11 had N fertilizer cost reduced by 12.5 percent. The treatment production costs were based on the onion production cost plus the retail cost and application cost of the products in each treatment.

Gross economic returns were calculated by crediting each marketable onion class with the average price of onions paid to the grower from the beginning of the marketing season in early August through January. Average prices were calculated for the years 1992 through 1999 from data prepared by the U.S. Dept. of Agriculture Agricultural Marketing Service, Idaho Falls, Idaho. Average prices reflecting adjustments for packing and shipping costs in U.S. dollars per cwt were: $4.05 for medium grade bulbs, $6.80 for jumbo grade bulbs, and $9.63 for colossal grade bulbs.

Treatment differences were compared using ANOVA and least significant differences at the 5 percent probability level, LSD (0.05).

## Results and Discussion

There was no significant difference in plant population, plant height, onion yield and quality, and profit between any of the treatments and the check, except for treatment 6 (Tables 4 and 5). Treatment 6 (Humi-zyme-RX) resulted in significantly lower plant height, total yield, colossal onion yield, and profits. Humi-zyme-RX is designed to be a complete fertilizer, and the onions in this treatment were not sidedressed with N. Humi-zyme-RX was broadcast pre-plant, and this application mode could have resulted in a concentration of the product on the soil surface. It may have been inaccessible to the onion roots.

Table 1. Non-conventional additives, rates, and application modes. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1999.

| Treatment | Company | Products | Rate | Application mode |
|---|---|---|---|---|
| | | | Amount/acre | |
| 1 | Ag Concepts | Jump Start 5-5-5 | 1.5 gal | in seed furrow |
| | | Jump Start 5-5-5 | 1 gal | 1st sidedress |
| | | Jump Start 5-5-5 | 1 gal | 2nd sidedress |
| 2 | Ag Concepts | Agzyme | 12.5 oz | 10-in band over row pre-plant |
| | | Humaide | 1 gal | |
| | | Kelp Treat | 2 qt | |
| | | Jump Start 5-5-5 | 1 gal | 1st sidedress |
| | | Jump Start 5-5-5 | 1 gal | 2nd sidedress |
| 3 | Ag Concepts | Jump Start 5-5-5 | 1 gal | 10-in band over row pre-plant |
| | | Humaide | 1 qt. | |
| | | Kelp Treat | 2 qt | |
| | | Agzyme | 6 oz | 1st sidedress |
| | | Kelp Treat | 1 qt | |
| | | Humaide | 1 qt | |
| 4 | Horizon Ag-Products | Agri-Plus | 40 lb | broadcast pre-plant |
| | | Quantum-H | 1 gal | in seed furrow |
| | | Quantum-H | 1 gal | 1st sidedress |
| | | Quantum-H | 1 gal | 2nd sidedress |
| 5 | RSA Microtech | RSA Humic acid | 1 gal | in seed furrow |
| | | RSA Humic acid | 1 gal | 1st sidedress |
| 6 | Dynamite Marketing | Humi-Zyme RX | 100 gal | broadcast pre-plant |
| 7 | Agri-Gro | Agrigro | 1 pint | 10-in band over row pre-plant |
| | | Agrigro | 1 pint | in seed furrow |
| | | Agrigro | 1 pint | 1st sidedress |
| | | Agrigro | 1 pint | 2nd sidedress |
| | | Agrigro | 1 pint | foliar 3 times |
| 8 | Agri-Gro | Agrigro | 1 pint | 10-in band over row pre-plant |
| | | Agri-Calcium | 2.5 gal | |
| | | Agrigro | 1 pint | in seed furrow |
| | | Agrigro | 1 pint | 1st sidedress |
| | | Agri-Calcium | 2 gal | |
| | | Agrigro | 1 pint | 2nd sidedress |
| | | Agri-Calcium | 2 gal | |
| | | Agrigro | 1 pint | foliar 3 times |
| 9 | Huma Grow | Pop-up mix | 3 gal | in seed furrow |
| | | Blend | 1 qt | 1st sidedress |
| | | Superphos | 2 qt | |
| | | Blend | 1 qt | 2nd sidedress |
| | | Superphos | 2 qt | |
| | | Sulfur | 8 oz | 2nd foliar |
| | | Copper | 6 oz | |
| | | Calcium | 12 oz | |
| | | Vitol | 1 qt | 1st and 2nd foliar |
| 10 | UAP Northwest | Awaken | 2 quarts | in seed furrow |
| 11 | Kozgro | Kozgro | 20 oz | broadcast pre-plant |
| | | Kozgro | 17 oz | 1st and 2nd foliar |
| 12 | Check | | | |

Table 4. Onion yield and quality response to non-conventional additives. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1999.

| Treatment | Total yield | Marketable yield by grade | | | | Non-marketable yield | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total | >4 in. | 3-4 in. | 2¼-3 in. | Total rot | Neck rot | Plate rot | Black mold | No. 2s | Small |
| | cwt/acre | | | | | % of total yield | | | | cwt/acre | |
| 1- Ag Concepts 1 | 1,148.8 | 1,086.2 | 436.1 | 642.4 | 7.7 | 2.0 | 0.2 | 1.8 | 0.0 | 36.1 | 3.0 |
| 2- Ag Concepts 2 | 1,131.1 | 1,092.5 | 316.0 | 759.6 | 16.9 | 1.3 | 0.1 | 1.0 | 0.1 | 20.7 | 3.8 |
| 3- Ag Concepts 3 | 1,177.6 | 1,107.9 | 376.7 | 709.2 | 21.9 | 2.6 | 0.6 | 1.6 | 0.3 | 35.6 | 4.0 |
| 4- Horizon Ag-Prods. | 1,154.4 | 1,091.3 | 372.1 | 707.7 | 11.5 | 2.3 | 0.2 | 1.9 | 0.2 | 35.7 | 1.7 |
| 5- RSA Microtech | 1,165.3 | 1,095.8 | 379.6 | 705.0 | 11.1 | 2.5 | 0.9 | 1.4 | 0.2 | 38.8 | 1.4 |
| 6- Humi-Zyme-RX | 957.3 | 905.5 | 173.1 | 695.5 | 36.9 | 1.6 | 0.6 | 1.0 | 0.0 | 34.4 | 2.6 |
| 7- Agri-Gro 1 | 1,226.6 | 1,174.4 | 400.6 | 763.2 | 10.7 | 1.8 | 0.4 | 1.4 | 0.0 | 28.3 | 1.2 |
| 8- Agri-Gro 2 | 1,106.4 | 1,032.4 | 369.0 | 656.1 | 7.3 | 2.0 | 0.0 | 1.8 | 0.1 | 50.5 | 1.4 |
| 9- Huma Grow | 1,181.2 | 1,108.1 | 396.8 | 704.7 | 6.6 | 2.2 | 0.8 | 1.1 | 0.3 | 47.2 | 0.4 |
| 10- Awaken | 1,124.9 | 1,076.9 | 385.7 | 680.0 | 11.3 | 1.9 | 1.0 | 0.8 | 0.1 | 24.5 | 1.5 |
| 11- Kozgro | 1,132.4 | 1,068.9 | 320.9 | 730.3 | 17.7 | 1.9 | 0.5 | 1.1 | 0.2 | 40.1 | 2.1 |
| 12- Check | 1,155.6 | 1,093.8 | 364.5 | 707.8 | 21.5 | 1.9 | 0.2 | 1.6 | 0.0 | 36.9 | 3.0 |
| Mean | 1,138.5 | 1,077.8 | 357.6 | 705.1 | 15.1 | 2.0 | 0.5 | 1.4 | 0.1 | 35.7 | 2.2 |
| LSD (0.05) | 106.8 | 108.2 | 83 | NS | NS | NS | NS | NS | NS | NS | NS |

Table 5. Onion plant population, plant height, maturity, and economic performance in response to non-conventional additives. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1999.

| Treatment | Plant population | Plant height July 30 | Maturity Aug. 27 | Production cost | Gross returns | Profit |
|---|---|---|---|---|---|---|
| | plants/acre | in | % | $/acre | | |
| 1- Ag Concepts 1 | 131,340 | 31.7 | 43.3 | 3,832.0 | 8,600.0 | 4,768.0 |
| 2- Ag Concepts 2 | 132,660 | 31.9 | 46.7 | 3,815.0 | 8,277.0 | 4,462.0 |
| 3- Ag Concepts 3 | 137,280 | 31.8 | 47.5 | 3,874.0 | 8,539.0 | 4,665.0 |
| 4- Horizon Ag-Prods. | 130,020 | 31.9 | 46.7 | 3,844.0 | 8,443.0 | 4,599.0 |
| 5- RSA Microtech | 123,420 | 31.3 | 45.0 | 3,835.0 | 8,495.0 | 4,660.0 |
| 6- Humi-Zyme-RX | 138,600 | 29.9 | 42.5 | 3,615.0 | 6,546.0 | 2,931.0 |
| 7- Agri-Gro 1 | 127,380 | 30.8 | 44.2 | 3,968.0 | 9,090.0 | 5,122.0 |
| 8- Agri-Gro 2 | 132,660 | 31.8 | 40.0 | 3,821.0 | 8,045.0 | 4,224.0 |
| 9- Huma Grow | 135,960 | 31.8 | 43.3 | 3,906.0 | 8,640.0 | 4,734.0 |
| 10- Awaken | 136,620 | 32.3 | 45.0 | 3,775.0 | 8,384.0 | 4,608.0 |
| 11- Kozgro | 137,940 | 31.4 | 41.7 | 3,789.0 | 8,128.0 | 4,339.0 |
| 12- Check | 145,200 | 32.0 | 45.8 | 3,812.0 | 8,410.0 | 4,598.0 |
| Mean | 134,090 | 31.6 | 44.3 | 3,823.8 | 8,299.8 | 4,475.8 |
| LSD (0.05) | NS | 1.2 | NS | 160 | 847 | 702 |