Response of Warm-Season Vegetable Crops to Controlled-Release N in the Low Desert Southwestern U.S. (Year 2)

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Introduction:

Meeting the market's rigid standards for produce quality may result in excess nitrogen (N) being applied to fields, which can affect local groundwater quality. In a recent study, Arizona and California both ranked in the top five states for nitrate content in wells. California has called for voluntary adoption of best management practices (BMPs), which Arizona now requires of growers.

Challenge:

BMPs generally involve nutrient timing, rates, and placement. Controlled-release N sources (CRN) are another promising strategy for effective nutrient management, but their higher cost requires research on application strategies that maximize effectiveness at the lowest dosages.

Research:

This second-year study gathered results from two CRNs, GAL-Xe® 43 and GAL-Xe 44, on tomatoes, watermelons, chili peppers, and sweet corn. All trials except sweet corn were run using a randomized complete block with four replications on existing crop fields in California or Arizona. Sweet corn was a demonstration experiment. Standard practices were used for all nutrients except N. Harvesting and grading for marketability were performed using standard industry practices.

Methodology:

Tomatoes, watermelons, and chili peppers: Treatments included a control, urea, GAL-Xe 43, and GAL-Xe 44. All treatments were tested at 100 and 200 kg N/ha. Plots also received 40–45 kg N/ac (MAP, 11-52-0) before planting. Sprinkler irrigation established the fields, which were furrow irrigated after establishment (except chili peppers, which received drip irrigation).

Sweet corn: Treatments included frequent applications of GSP of 115 gal AN20 (245 kg N/ha) through drip lines, GAL-Xe 43 at 100 and 200 kg N/ha, and GAL-Xe 44 at 100 and 200 kg N/ha. At grower's request, the plots treated with CRN products also received AN20 at 28 gal/ac (60 kg N/ha). All plots received 50 gallons of 3-35-0 as a phosphorus source. Sprinkler irrigation established the fields, which were then irrigated through buried drip lines.

Results:

Tomatoes and watermelons: Marketable yields increased with N rate. Early yield and total yield were higher for tomatoes receiving CRN.

Chili peppers: CRN plots showed higher rates of available soil nitrogen midseason, but did not result in statistically significant increases in yield.

Sweet corn: CRN plots showed increased yields. Differences in ear quality were only minimally important.

Practical Applications:

Cumulative yields for tomatoes and watermelons were similar for GSP and CRN by the fifth harvest, but as early yields have more market value, the CRN products produced financial gains for the grower.

N (kg/ha)	N Management	Ear Length (cm)	Unfilled tip (cm)	Leaf N (%)	NH_4-N (mg/kg)	NO_3-N (mg/kg)	Marketable yield (MT/ha)
GSP	AN20	18.4	0.7	1.22	nd	nd	33.9
100	CRN 43	18.5	1.0	1.30	4.4	23.8	43.8
200	CRN 43	18.5	1.1	1.14	5.1	36.6	48.3
100	CRN 44	19.0	1.4	1.17	7.1	28.2	49.9
200	CRN 44	19.3	1.3	1.52	4.8	28.5	46.1
LSD (P=0.05)		0.7	0.6	0.59	NS	NS	9.8

Average ear length, unfilled tip, leaf N, inorganic soil N, and marketable yield of sweet corn to fertilizer N.