Development And Demonstration of Nitrogen Best Management Practices For Sweet Corn In The Low Desert

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Introduction

- Florida ranks first in sweet corn production.
- California ranks second in sweet corn production.
- New York/Georgia alternate for third place!
- Main California production areas are: Imperial, Riverside, Fresno, Contra Costa and Tulare.

Sweet Corn Imports

- Mexico
- Canada
- Peru
- Indonesia

Sweet Corn

- 6,790 acres in Imperial County (1999).
- 1,760 acres in the Coachella Valley (2002).
- 300 boxes (45 pound/box) per acre average in Imperial County and Coachella Valley
- Sweet corn is an important spring crop in the low desert. Fall crop acreage is declining.
- Large amounts of fertilizer are typically used to produce high quality sweet corn.

Methods

- Experiments were conducted in grower-cooperator fields in the Coachella Valley.
- Spring planted sweet corn typically follows winter lettuce.
- Fall planted sweet corn typically follows spring broccoli or cauliflower.
- Fertilizer practices were typical grower practices:
  - 40-60 gallons per acre of 3-35-0 preplant

Preplant: 40-60 gallons per acre of 3-35-0

Soil Sampling

- Soil samples are collected prior to planting and prior to every side dress.
- Soil samples are split into two subset of samples:
  - One sub-sample is analyzed using the N Quick Test developed by Hartz.
  - The other sub-sample is air dried, extracted with KCl and ammonium-N and Nitrate-N is determined using steam distillation (Keeney and Nelson, 1982).

Tissue Sampling

- Basal stalks were collected immediately prior to each side dress. However, in most cases the first side dress occurred before the corn had developed a basal stalk. Stalks were always collected before the second side dress.
- The stalks were oven dried, ground, and tested for nitrate-N using method of Baker & Smith (1969).

Whole plant samples

- Whole plants were collected before each sidedress.
- These plants were oven dried and weighed to assess growth response to sidedress N application.

Harvest Data

- At maturity sweet corn was harvested and graded for determination of marketable yield.
- On selected sites extensive post harvest ear quality evaluations were conducted at UC Davis Mann Lab.

Sidedress Treatments (2^2 factorial)

1. No sidedress N	3. Second sidedress only
2. First sidedress N only	4. First and second sidedress

SideDress Treatments (2^3 factorial)

1. No sidedress N	5. First and second sidedress
2. First sidedress N only	6. First and third sidedress
3. Second sidedress N only	7. Second and third sidedress
4. Third sidedress N only	8. First, second, and third sidedress

Side Dress #1: 30-50 gallons per acre of UN32

Side Dress #2: 40-50 gallons per acre of UN32

1999 Experiments

Experiment	Crop	Planting Date	Harvest Date	Location
47	S. corn	02-13-99	06-03-99	Thermal
47A	S. corn	03-17-99	06-18-99	Indio
47B	S. corn	08-20-99	11-01-99	Thermal
47C	S. corn	08-30-99	11-16-99	Thermal

2000 Experiments

Experiment	Crop	Planting Date	Harvest Date	Location
47D	S. corn	02-04-00	05-19-00	Indio
47E	S. corn	02-22-00	05-23-00	Mecca
47F	S. corn	08-18-00	10-26-00	Thermal
47G	S. corn	08-28-00	11-16-00	Thermal

2001 Experiments

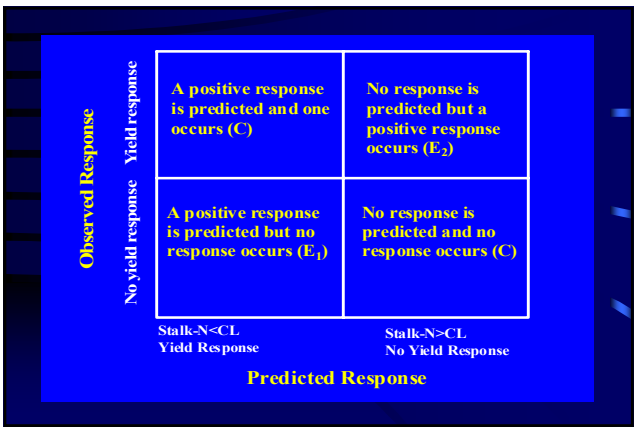
Experiment	Crop	Planting Date	Harvest Date	Location
47H	S. corn	02-16-01	05-22-01	Thermal
47I	S. corn	02-19-01	05-23-01	Indio
47J	S. corn	08-18-01	Lost	Thermal

Response of sweet corn to sidedress N in experiment 47

Sidedress	Yield Mg/ha	US#1 Mg/ha	Width cm	Length cm	Unfilled cm
0/0/0	18.9	13.3	4.95	8.54	0.26
SD/0/0	16.6	10.2	4.79	8.75	0.31
0/SD/0	23.0	15.3	5.05	8.10	0.25
0/0/SD	16.5	10.7	5.05	8.20	0.19
SD/SD/0	17.9	12.5	5.05	8.67	0.19
SD/0/SD	19.9	13.5	5.11	8.72	0.25
0/SD/SD	23.4	16.8	5.11	8.22	0.34
SD/SD/SD	15.6	9.6	4.54	8.36	0.25

Response of sweet corn to sidedress N in experiment 47B

Sidedress	Yield Mg/ha	US#1 Mg/ha	Width cm	Length cm	Unfilled cm
0/0	14.79	5.72	4.66	19.23	0.09
SD/0	14.66	5.61	4.56	19.31	0.20
0/SD	15.43	5.68	4.59	19.36	0.29
SD/SD	15.93	5.55	4.53	19.54	0.26



Stalk Nitrate

- 9000 PPM at the 3 leaf stage
- 12,000 PPM at the 6-leaf stage
- 11,000 PPM at the 9-leaf stage
- 9,000 PPM at the 12-leaf stage

Doerge et al. 1991

A comparison of predicted and actual response to side dress N based on stalk values.

1

Exp.	Side dress	Stalk	Diag.	Pred. Resp.	Act. Resp.	Diag. Acrcy
47A	1	9875	S	-	-	C
47	2	5125	D	+	-	E_1
	2	5125	D	+	-	E_1
47A	2	9750	S	-	-	C
	2	10000	S	-	-	C

S=sufficient, D=deficient, + =positive response, - =negative response
E_1= error in diagnosis predicts response that did not occur
E_2=error in diagnosis predicts no response but a positive response occurred,
C=correct response

A comparison of predicted and actual response to side dress N based on stalk values.

2

Exp.	Side dress	Stalk	Diag.	Pred. Resp.	Act. Resp.	Diag. Acc.
47B	2	16250	S	-	-	C
	2	16250	S	-	-	C
47C	2	21250	S	-	-	C
	2	22500	S	-	-	C
47	3	9500	S	-	-	C
	3	9750	S	-	-	C
	3	8250	D	+	+	C
	3	10000	S	-	-	C

S=sufficient, D=deficient, + =positive response, - =negative response
E_1= error in diagnosis predicts response that did not occur
E_2=error in diagnosis predicts no response but a positive response occurred,
C=correct response

Soil quick test

- 25 PPM as preliminary soil test critical level.
- With few exceptions all soil nitrate-N levels were above this preliminary critical concentration.
- We observed a general lack of response to N fertilization.

Comparison of predicted and actual response to side dress N based on conventional soil test values 1

Exp.	Side Dress	Soil Test	Diag.	Pred. Resp.	Actual Resp.	Diag. Acc.
47	1	24.3	S	-	-	C
47A	1	86.6	S	-	-	C
47B	1	73.7	S	-	-	C
47C	1	65.1	S	-	-	C
47	2	35.4	S	-	-	C
	2	33.3	S	-	-	C

S=sufficient, D=deficient, + =positive response, - =negative response
E_1= error in diagnosis predicts response that did not occur
E_2=error in diagnosis predicts no response but a positive response occurred, C=correct response

Comparison of predicted and actual response to side dress N based on soil test values 2

Exp.	Side Dress	Quick Soil	Diag.	Pred. Resp.	Actual Resp.	Diag. Acc.
47A	2	44.1	S	-	-	C
	2	80.2	S	-	-	C
47B	2	91.1	S	-	-	C
	2	114.2	S	-	-	C
47C	2	50.3	S	-	-	C
	2	134.8	S	-	-	C

S=sufficient, D=deficient, + =positive response, - =negative response
E_1= error in diagnosis predicts response that did not occur
E_2=error in diagnosis predicts no response but a positive response occurred, C=correct response

Comparison of predicted and actual response to side dress N based on quick soil test values 1

Exp.	Side Dress	Quick Soil	Diag.	Pred. Resp.	Actual Resp.	Diag. Acc.
47	1	32.2	S	-	-	C
47A	1	31.1	S	-	-	C
47B	1	81.6	S	-	-	C
47C	1	73.4	S	-	-	C
47	2	36.2	S	-	-	C
	2	24.9	S	-	-	C

S=sufficient, D=deficient, + =positive response, - =negative response
E_1= error in diagnosis predicts response that did not occur
E_2=error in diagnosis predicts no response but a positive response occurred, C=correct response

Comparison of predicted and actual response to side dress N based on quick soil test values 2

Exp.	Side Dress	Quick Soil	Diag.	Pred. Resp.	Actual Resp.	Diag. Acc.
47A	2	38.2	S	-	-	C
	2	64.4	S	-	-	C
47B	2	74.3	S	-	-	C
	2	61.9	S	-	-	C
47C	2	52.6	S	-	-	C
	2	87.1	S	-	-	C

S=sufficient, D=deficient, + =positive response, - =negative response
E_1= error in diagnosis predicts response that did not occur
E_2=error in diagnosis predicts no response but a positive response occurred, C=correct response

Comparison of predicted and actual response to side dress N based on quick soil test values 3

Exp.	Side Dress	Quick Soil	Diag.	Pred. Resp.	Actual Resp.	Diag. Acc.
47	3	34.8	S	-	-	C
	3	37.0	S	-	-	C
	3	29.3	S	-	-	C
	3	41.8	S	-	-	C

S=sufficient, D=deficient, + =positive response, - =negative response
E_1= error in diagnosis predicts response that did not occur
E_2=error in diagnosis predicts no response but a positive response occurred, C=correct response

Response of sweet corn to sidedress N in experiment 47H

Treatment	Soil NO3-N before 1st SD	Soil NO3-N before 2nd SD	Stalk NO3-N before 2nd SD	Yield Mg/ha
0/0	3.1	25.1	4000	8.5
SD/0	2.9	24.1	6500	16.1
0/SD	3.0	18.4	5750	8.5
SD/SD	3.0	31.4	8000	18.5

Summary

- Overall, there was high residual N in the fields used to produce sweet corn following vegetable production.
- Generally we observed a lack of response of sweet corn to N in most experiments.
- The first sidedress generally occurred before a basal stalk was available, thus this test would not be useful for the first sidedress.

Summary (continued)

- In most instances we observed no yield response when soil nitrate-N > 25ppm.
- Additional evaluation on N responsive sites are needed to validate suitability of basal stalk and soil tests.