UF IFAS Extension UNIVERSITY of FLORIDA

CIR1141

Fertilization of Strawberries in Florida[1]

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Introduction

Strawberries are produced on 5000–6000 acres each year in Florida and the 1992-93 season had a crop value of $103 million (Freie and Pugh 1994). Although the major strawberry production area is in Hillsborough county, there are numerous other production areas throughout the state, notably Alachua, Bradford, Dade, Manatee, Palm Beach, and Polk counties (Hochmuth 1988).

Production costs for strawberries average $14,000 per acre; however, fertilizer accounts for only 2% of the total costs (Smith and Taylor 1993). Although fertilizer comprises only a small fraction of strawberry production costs, proper fertilization is important for maximizing yield and fruit quality, and for minimizing potential negative impact to the environment caused by leaching or runoff of excess fertilizer.

Fertilizaton Recommendations

Strawberry P and K fertilization recommendations are based on the calibrated Mehlich-1 soil test results and vary according to the soil-test level of P and K (Table 1). N requirements are 150 lb N per acre for the total season (200 days) (Hochmuth and Hanlon (in press)). Growers should avoid the temptation to apply more N because excess N can increase the amount of malformed fruits (Albregts and Howard 1982) and can lead to excessive vegetative plant growth and reduced yields. Rates of K higher than recommended reduced average strawberry fruit size and yield (Albregts et al. l991; Albregts et al. l994).

Drip Irrigation

Drip irrigation can result in up to 50% reduction in water use for strawberries, compared to overhead sprinklers (Myers and Locascio 1972). Nearly all strawberries in Florida now are irrigated with drip irrigation systems. Although drip irrigation can improve irrigation efficiency, care must be exercised to operate the system properly so optimum amounts of water are applied. Inadequate irrigation can reduce yields and over-irrigation can leach N and K. Irrigation amounts should be scheduled to meet the strawberry crop evapotranspiration needs which range from 800 gal per acre per day in October to 3000 gal per acre per day in April (Clark 1993).

Fertigation

Applying fertilizer through the drip irrigation system (fertigation) offers the potential for increasing efficiency of application of leachable nutrients such as N and K (Locascio and Myers l975; Locascio and Martin l985). With fertigation, N and K can be applied in small amounts corresponding to crop N and K requirements. Current recommendations call for incorporating all the P and micronutrients and up to 30 lb per acre each N and K_2O in the beds preplant. (Figure 1) The remaining N and K can be injected through the drip irrigation system.

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Figure 1.

N and K can be injected on a daily or weekly basis. Schedules for N and K injection were presented for strawberries (Hochmuth and Clark 1991); however, recent research has made it possible to reduce strawberry fertilization rates (Hochmuth et al. 1994; Albregts et al. 1994). Fertilization rates can be reduced from 1.0 lb N and K_2O each per acre per day. Revised fertigation recommendations are presented in Table 2.

Petiole Sap-Testing

Timely plant tissue analysis for N and K is important for optimizing N and K injection and for aid in making decisions regarding amounts of N and K to inject. Using research data from Dover AREC and commercial strawberry farms, extension scientists developed petiole fresh sap-testing procedures. The petiole sap sufficiency ranges for N and K are presented in Table 3. There are several sap-testing kits available for determining sap N and K concentrations. (Figure 2) The brochure describing the procedures available from the county Extension offices, is entitled "Guide for Plant Petiole Sap-Testing for Vegetable Crops."

Figure 2.

Whole-Leaf Testing

Petiole sap analyses should be backed up by routine analyses of whole leaves by a tissue testing laboratory. (Figure 3) Presently, sap testing is limited to N and K because either test kits do not exist or procedures have not been developed for other nutrients. Sufficiency ranges for nutrients in whole strawberry leaves are presented in Table 4.

Figure 3.

Checklist for Successful Strawberry Drip Fertigation

- Practice calibrated soil testing to determine lime and fertilizer requirements.
- Select correct rates of fertilizer to apply to soil before bedding and mulching. Preplant (broadcast) N and K_2O should not exceed 30 lb each per acre.
- Practice careful irrigation management to avoid over-irrigation which leaches N and K from the root zone.
- Inject N and K in daily or weekly injections at rates not exceeding 0.60 lb each N and K_2O per acre per day except for 0.75 lb each N and K_2O per acre per day in February and March.
- Monitor petiole sap N and K concentrations and use that information to adjust N and K injection schedules or rates.
- Back up petiole sap-testing with laboratory analyses of whole leaves.

Literature

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Table 1. Interpretation of Mehlich-1 soil test and revised nutrient.

Element	Very Low	Low	Medium	High	Very High
	parts per million soil				
P	<10	10–15	16–30	31–60	>60
K	<20	20–35	36–60	61–125	>125
Fertilizer	lb per acre				
P_2O_5	150	120	100	0	0
K_2O	150	120	100	0	0

Table 2. N and K fertigation recommendations for strawberries.

Stage in season	Injection rate (lb/acre/day)[z]	
	N	K_2O
First 2 weeks	0.3	0.3
February/March	0.75	0.75
All other months	0.6	0.6

[z] Based on cultural system with beds on 4-ft centers and up to 30 lb each N and K and K_2O per acre broadcast in bed before planting on soils testing very low in K.
K injection rates drop by about 20% as soil test goes from VL to L andagain from L to Medium.

Table 3. Sufficiency ranges for petiole sap N and K concentrations for strawberries, October planting.

Month of season	Petiole sap nutrient concentration(ppm)	
	NO_3- N	K
November	800–900	3000–3500
December	600–800	3000–3500
January	600–800	2500–3000
Febraury	300–500	2000–2500
March	200–500	1800–2500
April	200–500	1500–2000

Table 4. Sufficiency nutrient ranges in most-recently-matured whole leaves (blade plus petioles) of strawberries.

Time of Sampling	Status	N	P	K	Ca	Mg	S	Fe	Mn	Zn	B	Cu	Mo
		%						ppm					
Initial Harvest	Deficient	<3.0	0.2	1.5	0.4	0.25	0.25	50	30	20	20	5	--[z]
	AdequateRange	3.0–3.5	0.2–0.4	1.5–2.5	0.4–1.5	0.25 -0.50	0.25–0.80	50–100	30–100	20–40	20–40	5–10	--
	High	>3.5	0.4	2.5	1.5	0.50	0.80	100	100	40	40	10	--
	Toxic (>)	--	--	--	--	--	--	--	800	--	--	--	--
Midseason	Deficient	<2.8	0.2	1.1	0.4	0.2	0.25	50	25	20	20	5	0.5
	AdequateRange	2.8–3.0	0.2–0.4	1.1–2.5	0.4–1.5	0.2–0.4	0.25–0.80	50–100	25–100	20–40	20–40	5 –10	0.5–0.8
	High	>3.0	0.4	2.5	1.5	0.4	0.80	100	100	40	40	10	0.8
	Toxic (>)	--	--	--	--	--	--	--	800	--	--	-	--

[z] Values not available