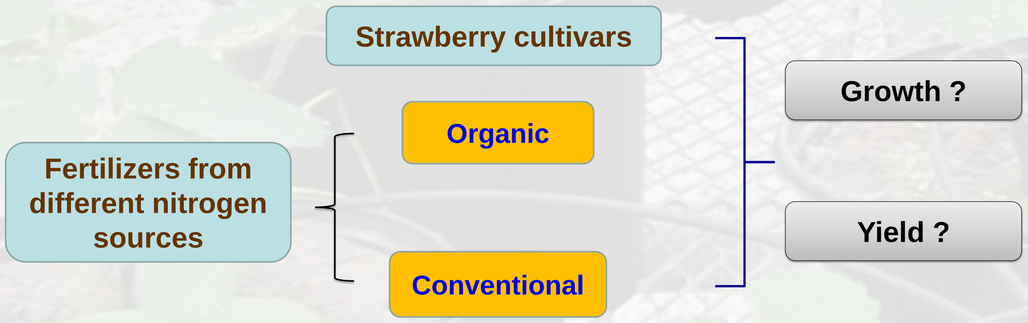
Influence of Fertilizers from Different Nitrogen Sources on Strawberry (*Fragaria* × *ananassa*) Production

Yurui Xie, Xin Zhao, and Zack Black
Horticultural Sciences Department, University of Florida, Gainesville, FL 32611

Abstract

In this greenhouse pot study, fertilizers from different nitrogen sources used in organic and conventional production were compared regarding their effects on strawberry growth and yield performance. Two strawberry cultivars Sensation™ Brand Florida127 and Winterstar™ were evaluated. The three fertilizer treatments included two fertilizers allowed in certified organic production differing in nutrient ingredients and a conventional fertilizer. With respect to the growth parameters, fertilizer treatments affected plant leaf number, crown and canopy size at the final harvest, while some differences were observed between strawberry cultivars at the early stage. Strawberry harvest took place during Dec. 2014 to Apr. 2015. Interestingly, except for total fruit number, strawberry yield components were not significantly impacted by the fertilizer treatments. In terms of the fruit yield throughout the production period, 'Florida127' showed fewer total fruit number per plant but higher average fruit weight than Winterstar™, whereas Winterstar™ exhibited lower levels of marketable and total fruit weight.

Introduction



Materials and Methods

- ✓ A greenhouse pot study on the University of Florida campus, Gainesville, FL
- ✓ Randomized complete block design with 4 replications, 12 plants per treatment per replication
- ☐ 2 strawberry cultivars: Sensation™ Brand Florida127 and Winterstar™
- ✓ Strawberry plugs planted in 7.6 L pots filled with sandy soil (Candler sand) from a certified organic field in Citra, FL on Oct. 30, 2014
- ✓ Pre-plant fertilization rate: approximately 20% of total N
- ☐ 3 fertilizer treatments:
- ✓ GATOR 96002 Organic Liquid 3N-0P-5.0K (referred to as Howard)
  - OMRI listed
  - Derived from natural sulfate of potash and sodium nitrate
- ✓ Neptune's Harvest 2N-0P-1.7K + Potassium Sulfate 0N-0P-41.5K (referred to as Neptune)
  - Ingredients: Hydrolyzed fish, molasses, seaweed extract, humate, and yucca extract
- ✓ Mayo Fertilizer 6N-0P-6.6K + Potassium Chloride 0N-0P-49.8K (referred to as conventional)
  - Derived from ammonium nitrate, calcium nitrate, disodium octaborate, magnesium nitrate solution, potassium nitrate, urea nitrate, potassium chloride, and zinc sulfate
- ✓ 1:1.7 ratio of N:K for all fertilizer treatments
- ✓ Fertilizer injection through Dosatron injectors
- ✓ A single 2 L/hour drip emitter was used for each plant
- ✓ 200 mg/L N fertilizer solution applied through drip at every watering
- ✓ Watering duration was adjusted as needed throughout the season, 2-3 events per day
- ✓ Measurements:
  - Leaf number, canopy and crown size, chlorophyll content index at different stages
  - Fruit number and weight, marketable and total yields

Acknowledgements
This project is partly funded by a grant from the Walmart Foundation and administered by the University of Arkansas System Division of Agriculture Center for Agricultural and Rural Sustainability.

Results

Table 1. Analysis of variance of the effects of fertilizer (fer) and cultivar (cv) on strawberry growth parameters during the production season.

		Leaf number per plant			Canopy size (cm)			Crown size (cm)			Chlorophyll content index (SPAD value)		
Effect	df	25 Nov. 2014	9 Jan. 2015	20 Apr. 2015	25 Nov. 2014	9 Jan. 2015	20 Apr. 2015	25 Nov. 2014	9 Jan. 2015	20 Apr. 2015	25 Nov. 2014	9 Jan. 2015	20 Apr. 2015
cv	1	**	NS	NS	NS	*	NS	*	NS	NS	NS	NS	*
fer	2	NS	NS	*	NS	NS	**	NS	NS	**	NS	NS	NS
fer x cv	2	NS	NS	**	NS	NS	*	NS	NS	NS	NS	NS	NS

NS, *, **, *** Non-significant or significant at P ≤ 0.05, 0.01, or 0.001, respectively.

Table 2. Cultivar and fertilizer effects on strawberry growth parameters at the final harvest (20 Apr. 2015).

Cultivar	Fertilizer	Leaf number per plant	Canopy size (cm)	Crown size (cm)
Florida127	Conventional	18.2 b[z]	26.8 bc	48.5 a
	Neptune	24.6 a	31.8 a	49.4 a
	Howard	20.9 ab	28.6 b	41.1 b
Winterstar™	Conventional	24.6 a	28.4 bc	50.9 a
	Neptune	23.4 a	29.3 ab	43.0 a
	Howard	19.1 b	25.8 c	36.4 b

[z]Multiple comparisons conducted among the six means across the two cultivars. Means within the same column followed by the same letter do not differ significantly by Fisher's least significant difference test at P ≤ 0.05.

Table 3. Cultivar effects on runner and open flower numbers of strawberry during early stage (Nov. – Dec. 2014).

Cultivar	Runner (no./plant)	Open flower (no./plant)
Winterstar™	2.5 a	0.6 a
Florida127	1.8 b	0.3 b

Table 4. Cultivar effects on marketable and total strawberry yields during the 2014 – 2015 production season.

Cultivar	Marketable fruit number (no./plant)	Total fruit number (no./plant)	Average marketable fruit weight (g/fruit)	Marketable fruit yield (g/plant)	Total fruit yield (g/plant)
Florida127	15.9 a	23.0 b	19.7 a	312.7 a	395.4 a
Winterstar™	16.6 a	25.2 a	14.4 b	239.1 b	308.7 b

Table 5. Fertilizer effects on marketable and total strawberry yields during the 2014 – 2015 production season.

Fertilizer	Marketable fruit number (no./plant)	Total fruit number (no./plant)	Average marketable fruit weight (g/fruit)	Marketable fruit yield (g/plant)	Total fruit yield (g/plant)
Conventional	15.4 a	22.9 b	17.9 a	275.6 a	349.8 a
Neptune	17.4 a	26.0 a	17.3 a	296.9 a	377.9 a
Howard	16.0 a	23.4 b	16.0 a	255.1 a	328.5 a

Conclusions and Discussion

- ✓ Overall, cultivars showed greater effects on strawberry growth and yield in contrast to the fertilizer treatments.
- ✓ At the final harvest, strawberry plants fertilized with GATOR 96002 Organic Liquid 3N-0P-5.0K had the smallest crown size, while significant cultivar by fertilizer interaction effects were observed in leaf number and canopy size.
- ✓ Winterstar™ showed more runners than 'Florida127' during the early stage.
- ✓ Strawberry plants fertilized with Neptune's harvest 2N-0P-1.7K exhibited higher total fruit numbers during the production season in comparison with the other two fertilizer treatments; however, the fertilizer treatments did not differ significantly in marketable fruit number, average marketable fruit weight, and marketable and total fruit yields.
- ✓ Relatively high nutrient availability of Neptune's harvest 2N-0P-1.7K?
- ✓ 'Florida127' demonstrated greater fruit size and higher full-season marketable and total fruit yields as compared to Winterstar™.
- ✓ Winterstar™ showed an advantage in early production, whereas 'Florida127' demonstrated higher yielding potential.
- ✓ Fruit quality assessment is underway.