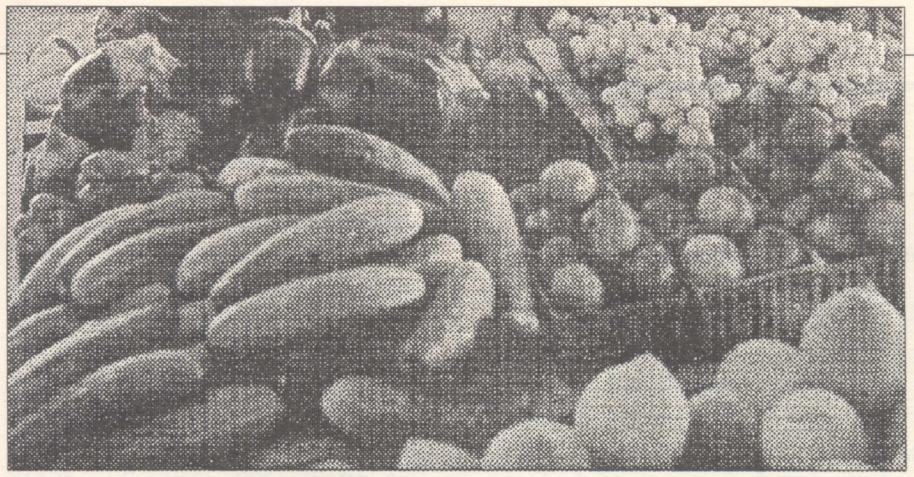

Research Update 1990

Fruits & Vegetables

First in Research Update Series on Fruits and Vegetables

This is the first fruit and vegetable research report published in a new publication series entitled "Research Update," inaugurated in 1989 by the Alabama Agricultural Experiment Station (AAES). The new series is meant to promote timely reporting of research results dealing with a specific crop or commodity, with distribution to all producers of that particular commodity. In this case, the target audience is all Alabama farmers who grow fruits and vegetables as commercial crops.

Today's highly competitive conditions make it doubly important that farmers have available the latest scientific information. Publication of this new series is meant to help meet that need. Efforts will be made to maintain up-to-date mailing lists of each producer group so all Alabama producers will receive the appropriate report annually.

Other information about fruit and vegetable production and latest recommendations are available from each county Extension Service office in Alabama.

Native Bee Efficient Pollinator of Blueberries

Rabbiteye blueberries are generally not self-fertile and require insect visitation to achieve the 40-60 percent fruit set expected by growers. Studies have shown that only 4 percent of the flowers on a bush will produce fruit if insect access to the flowers is prohibited.

Bees are the most abundant floral visitors to rabbiteye blueberries, seeking nectar and sometimes pollen rewards. Among these bees, the southeastern blueberry bee, *Habropoda laboriosa*, shows remarkable fidelity and pollination efficiency for rabbiteye blueberry. This bee resembles a small worker bumblebee in appearance and is easily distinguished from the much larger queen bumblebees.

The female blueberry bee lives solitarily, constructing well-concealed subterranean nests in sandy locations and producing only one generation of offspring a year in the spring. In Alabama and Georgia, females forage almost exclusively on species of wild and domestic blueberries for the pollen and nectar provisions needed to feed their offspring. Such fidelity can be important for pollination when there are other floral species blooming concurrently and competing for a pollinator's visits.

One reason for the blueberry bee's pollination efficiency is its ability to buzz each visited flower. This audible buzzing vibrates the bloom and releases pollen. Bees that do not buzz flowers, such as the honeybee, gain little, if any, pollen from the rabbiteye blueberry flower.

Experiments conducted by the AAES and at the USDA Fruit and Tree Nut Laboratories in Byron, Georgia, show that single floral visits by this bee can result in a 45 percent field fruit set on drip-irrigated commercial rabbiteye blueberries. The resulting fruits are equivalent to those from open-visited flowers in size, maturation date, and number of viable seeds. Since flowers persist for 3-5 days and can be visited many times per day (females visit over 10 flowers per minute), the activities of the blueberry bee alone can be responsible for the entire fruit set on cultivated rabbiteye blueberries in the Southeast.

Since no artificial management methods have been developed to replace or augment the activity of these efficient bees, farming practices that protect blueberry bee populations are critical for successful blueberry production.

J.H. CANE

Alabama Agricultural Experiment Station Auburn University
Lowell T. Frobish, Director Auburn University, Alabama

Super Sweet Corn Varieties Show Promise

Super sweet corn varieties showed their potential for the commercial market in 1989 AAES sweet corn variety trials. Super sweet varieties differ from traditional sweet corn varieties because they possess sugar concentrations as high as 35 percent and hold them much longer in both field and storage conditions.

Trials at the Gulf Coast Substation in Fairhope, the Chilton Area Horticulture Substation in Clanton, and the North Alabama Horticulture Substation in Cullman included 10 super sweet varieties (9 yellow and 1 white). Results from two locations are listed in the table. Fertilizer was applied according to soil test recommendations and pesticides and irrigation were applied as needed.

All of the varieties rated good to excellent on quality index. Good yielding varieties included Sweet Belle, Sweetie, Sunset, Jubilee, and possibly Summersweet 7900, and 8000 also showed promise for production in Alabama. Studies also showed that isolation of varieties or manipulation of planting dates will keep super sweet varieties from cross pollinating with other corn types. Cross pollination results in loss of some of the super sweet characteristics. The studies indicate that super sweet corn varieties germinate better under warm soil conditions, suggesting that the varieties may not perform as well if planted in cold soil.

D.W. PORCH

Performance of Super Sweet Corn Varieties

Variety	Yield/acre, dozen ears	Days to maturity	Quality index[1]
Gulf Coast Substation			
SS7900	1,761	80	4.5
SS8000	1,761	80	5.0
Showcase	1,325	77	5.0
How Sweet It Is[2]	1,162	77	5.0
SS7810	1,067	77	4.9
Excell	1,252	77	5.0
Crispin Sweet	1,470	77	4.9
Sunset	1,779	77	4.6
Sweet Belle	1,888	77	4.9
Sweetie	1,220	77	5.0
Chilton Area Horticulture Substation			
SS7900	1,234	76	4.1
SS8000	1,035	77	4.8
Showcase	926	76	4.4
How Sweet It Is	1,343	76	5.0
SS7810	1,452	76	4.4
Excell	1,053	72	5.0
Super Sweet Jubilee	1,476	76	5.0
Sunset	1,143	72	4.5
Sweet Belle	1,470	76	4.9
Sweetie	1,688	76	4.6

[1]Rating index: 5=excellent, 4=good, 3=fair, 2=poor, 1=very poor.
[2]White variety.

Root and Crown Rots Can Be Problem for Kiwi Plants

Considerable interest has been shown for production of kiwi as an alternative fruit crop. Prospects for such an Alabama enterprise appear quite lucrative since New Zealand, the main source of kiwifruit, is located below the equator and thus has a harvest season opposite of the United States.

AAES studies at several locations in the State have revealed some potential production problems with kiwi. One planting at the Wiregrass Substation in Headland was made in 1986 on land previously used for long-time peanut production. During the first year of growth, heavy summer rains at the Substation promoted the development of a soil-borne organism, *Pythium ultimum*, which caused root rot and killed more than 60 percent of the plants.

A 1986 planting at the Gulf Coast Substation in Fairhope developed well and some plants bore fruit in the fall of 1988. However, rainy weather caused by hurricane activity in September of that year saturated kiwi plantings, resulting in asphyxiation and leaf drop from approximately one-third of the plants. Many of the kiwi plants failed to "bud out" the following spring, and Pythium root rot and possible Phytophthora crown rots were found on nearly 30 percent of the plants during 1989.

Further studies indicate that these soil-borne problems can be reduced if the kiwi plantings are made on well-drained, light-textured soils.

A.J. LATHAM AND W.A. DOZIER, JR.

Soil Tests Accurately Predict Soil Fertility Needs of Sweet Potatoes

Sweet potatoes grow well on the sandy, acid soils found in Alabama. However, little research has been done to evaluate sweet potato response on soils with different levels of residual fertility. Such information could enable the Soil Testing Laboratory to make more accurate fertilizer recommendations.

To learn more about this issue, sweet potatoes were planted in 1988 and 1989 on existing, long-term soil fertility plots (since 1954) at three AAES locations: the Brewton and Prattville Experiment Fields and the

Sand Mountain Substation in Crossville. The purpose of the study was to determine yield and quality response of sweet potatoes to residual phosphorous (P) and potassium (K) and to rates of applied nitrogen (N), P, and K.

In 1988, yields at Brewton were less than half those at the other two locations due to late planting, dry weather, and late maturity. Yields at Prattville and Sand Mountain are presented in the table. At both locations, 80 pounds of N per acre (the current recommended N rate) resulted in highest yields and quality of potatoes. The application of P had a positive effect on yield at Prattville where even the "no P" plots tested high in P after 35 years of cropping. Residual soil P at Sand Mountain ranges from low in the "no P" plots to very high where 100 pounds per acre of P_2O_5 are applied annually. Here, additional direct P application even at the very high residual level benefited potato yields.

Sweet potatoes have a high K requirement and the current recommended rate of application is 100 pounds K_2O per acre. At Prattville, this rate produced the highest yields of both No. 1's and total potatoes even though the soil on these plots already tested very high in K. The very acid, no lime treatment reduced yields more at Sand Mountain than at Prattville.

Results of this test indicate that good sweet potato yields can be achieved in several areas of Alabama and that using lime and fertilizer recommendations based on soil tests results in highest marketable yields.

C.C. MITCHELL AND C.E. EVANS

Yields of U.S. No. 1 Sweet Potatoes and Soil Test Ratings Under Different Levels of Long-Term N, P, and K Fertilization

Treatment	Prattville Soil test rating[1]	Prattville Yield/ acre	Sand Mountain Soil test rating[1]	Sand Mountain Yield/ acre
		Cwt.		*Cwt.*
N rate				
0	---	36	---	66
20	---	70	---	60
40	---	70	---	93
80	---	107	---	114
120	---	102	---	81
160	---	92	---	105
P_2O_5 rate				
0	H	75	L	77
20	H	91	L	80
40	VH	92	M	98
60	VH	96	M	86
100	VH	107	VH	114
K_2O rate				
0	M	71	VL	15
20	M	80	L	36
40	H	83	L	60
60	H	86	M	70
80	H	92	M	66
100	VH	107	M	114
No lime[2]		84		44

[1]Soil test rating of plots based on residual level of plant nutrient: VL=very low; L=low; M=medium; VH=very high. Nitrogen does not build up in soils and therefore is not rated.

[2]pH was 5.0 at Prattville and 4.9 at Sand Mountain.

Fall-Applied Gibberellic Acid Protects Peaches Against Frost

Results of an AAES study initiated in 1988 indicate that fall applications of gibberellic acid (GA_3) delay spring bloom of peach trees and provide frost protection. Three applications of 0, 10, 50, and 100 parts per million (p.p.m.) GA_3, plus 0.2 percent Buffer-X surfactant were applied to 6-year-old Loring peach trees. The treatments were applied at monthly intervals to the point of run-off beginning in August.

GA_3-treated trees retained their foliage later in the fall than the control trees. Trees treated with 50 and 100 p.p.m. made vegetative growth of 6 and 11 inches, respectively, in the fall as shown in the table.

The treatments did not affect the number of flower buds that developed on the treated trees. However, 50 to 100 p.p.m. treatments delayed bloom in the spring, whereas the 10 p.p.m. treatment did not delay bloom. The 10 p.p.m. treatment resulted in a larger fruit set which required more fruit thinning. The highest yields were produced on trees treated with 10 p.p.m., resulting in a 39 percent increase in yield when compared to the control trees.

The results of this experiment compare favorably with an experiment that was conducted in 1986. A late spring frost occurred after bloom that year and reduced the crop considerably. As in the latest test, the greatest yields were produced on trees treated with 10 p.p.m. GA_3.

The fall-applied GA_3 appears to both increase the cold hardiness of the peach buds and delay bloom, and has potential as a method of frost protection.

W.A. DOZIER, JR., A.A. POWELL, A.W. CAYLOR, W.R. MCDANIEL, AND E.L. CARDEN

Effect of Fall Application of Gibberellic Acid on Loring Peaches

Gibberellic acid, p.p.m.	Fall shoot growth	Open blossoms, 3/14/89	Fruit thinned/ 14 in. shoot length	Yield/ tree
	In.	*Pct.*	*No.*	*Lb.*
0	0	77	3.7	85
10	0	75	6.1	138
50	6	57	5.1	105
100	11	46	5.0	115

New Herbicides Control Broadleaf Weeds in Strawberries

Three new herbicides that have potential to control broadleaf weeds in strawberries were evaluated in the summer of 1988 and spring of 1989 by the AAES. A strawberry planting at the Chilton Area Horticulture Substation in Clanton was renovated after harvest in June 1988 by plowing the middles and barring off the beds leaving a 6-inch-wide strip of strawberry plants in the row. A mixture of broadleaf weed seed that contained prickly sida, coffee senna, morningglory, and sicklepod were evenly distributed on the plots to ensure a uniform population of weed species in each plot. The herbicides were applied broadcast over the top after the weed seedlings emerged. Lactofen and fomesafen herbicides were evaluated at 0.25 pound per acre and aciflurofen was evaluated at 0.50 pound per acre.

Slight foliar injury was evident 3 days after treatment application, however, within 3 weeks the plants developed new growth and the injured foliage was not visible. Excellent control was achieved with all three herbicides of all weed species except sicklepod. The young sicklepod plants that were present when the herbicides were applied were killed; however, additional seedlings emerged.

Lactofen reduced strawberry runner development slightly, while fomesafen and aciflurofen severely reduced runner development. The effect on runner development resulted in substantial death to runners that were developing and growing when herbicides were applied.

In the spring of 1989, all herbicide-treated plots produced greater yields than the hand-hoed check plots. Lactofen-treated plots produced the highest yields, about 28 percent greater than the check plots.

A.W. CAYLOR, W.A. DOZIER, JR., J.A. PITTS, AND K.C. SHORT

Effect of Herbicides on Strawberry Plant Performance and Weed Control

Herbicide-rate/ acre	Foliar injury	Weed control	Runners/ 9 sq. ft.	Yield/ acre
	Pct.	*Pct.*	*No.*	*Lb.*
Lactofen-0.25 lb.	14	74	90	37,699
Fomesafen-0.25 lb.	13	79	66	31,435
Acifluorfen-0.50 lb	18	81	56	30,159
Hand-hoed, weed-free plots	0	100	106	26,984

Summer Screening Provides Heat-Tolerant Tomato Selections

Research at the Wiregrass Substation in Headland was conducted to evaluate fruit production of tomato varieties and breeding lines during the hot days and nights of the summer months. Earlier results had shown that the predominant reason for lack of fruit formation during high temperature conditions was a decrease in pollen fertility. Lines exhibiting heat tolerance showed higher pollen fertility but were found to be smaller.

Hybrids between the most heat-tolerant and heat-sensitive selections were analyzed and compared to parent lines and commercial variety performance. Populations derived from heat-tolerant parents outperformed their parents in fruit-setting ability as shown in the table. Of the recently released new heat-tolerant varieties, Heatwave and Solar Set, Heatwave showed promising results because it set large fruit under high temperatures.

Selections were made in the best populations and will be used in the breeding program to combine the genetic capability to set high-quality fruit under high temperatures with resistance to root-knot nematode, mosaic virus, and fusarium wilt.

F.K. DANE AND O.L.CHAMBLISS

Heat Set Ratings of Parent and F_2 Lines of Tomatoes

Line	Rating[1]
Parent lines and varieties	
Heatwave	3.2
AVRDC CL-5915-153-D4-3-3	3.0
Nagcarlan	3.0
Beaverlodge 6804	2.9
Red Cherry	2.8
Solar Set	1.9
Suncoast	1.3
Flora-Dade	0.9
F_2 lines	
AVRDC CL-5915-153 x Beaverlodge	3.8
Beaverlodge x Nagcarlan	3.7
AVRDC CL-5915-153 x Nagcarlan	3.5
Nagcarlan x Red Cherry	3.2
Beaverlodge x Red Cherry	3.1
Flora-Dade x AVRDC CL-5915-153	2.8
AVRDC CL-5915-153 x Red Cherry	2.7
Red Cherry x Suncoast	2.6
Flora-Dade x Nagcarlan	2.4

[1] 0 = no fruit set; 5=abundant fruit set.

Results of 1989 Tomato Variety Trials Released

Results of the 1989 tomato variety trials, conducted at the Gulf Coast Substation, Fairhope, and the Chilton Area Horticulture Substation, Clanton, have identified several tomato varieties with good production potential.

Of the varieties tested, Sunny, Celebrity, Mountain Pride, Hayslip, and Pacific, all varieties with demonstrated commercial potential in Alabama, produced high yields in the 1989 trials, verifying the performance of these varieties as standards for commercial production. Better Boy and Bonnie Nematode Resistant, popular gardening varieties, also produced high yields, as shown in table.

Four varieties introduced into the trials for the first time in 1989 performed exceptionally well, though further testing is needed before they are planted extensively. Solar Set, a heat-tolerant variety that has the ability to set fruit under high temperature conditions, had good fruit set during a hot period early in the season when other varieties had poor fruit set. It produces firm, shipping type fruit. Summit, a variety with a jointless pedicel which allows the stem to remain on the plant during harvest, also has firm fruit good for shipping and is a late season variety. Sunbelt, another new variety, produced an early yield of firm shipping-type fruit. Empire, the fourth new variety, produced very large fruit which may be too large for shipping but has potential for home use and direct marketing.

Two other new entries in the trial have uniquely high levels of foliage disease resistance. The early blight resistant lines (NCEBR-1 and -2) exhibited almost no early blight symptoms at mid to late season when other entries in the trial were showing severe symptoms. However, these lines did not rank among the best entries for yield.

P.B. STRNISTE AND
O.L. CHAMBLISS

Tomato Variety Trial Results

Variety	Marketable yield/acre	
	Total	5 x 6[1]
South Alabama, Fairhope	*Cwt.*	*Cwt.*
Sunny VF2	690	375
Hayslip VF2	670	422
Celebrity VF2NTMV	618	476
Pacific VF2	616	462
Bonnie Nematode Resistant VFN	604	226
Solar Set VF2	546	416
Mountain Pride VF2	520	272
Olympic VF2	516	374
Better Boy VFN	399	277
NCEBR-2 VF2	386	220
Summit VF2	360	252
NCEBR-1 VF2	348	64
Central Alabama, Clanton		
Celebrity VF2NTMV	822	449
Sunny VF2	817	294
Empire VF2NTMV	790	506
Pacific VF2	763	409
Mountain Pride VF2	752	281
Summit VF2	699	394
Solar Set VF2	699	334
Sunbelt VF2	698	353
Better Boy VFN	681	316
Olympic VF2	659	316
NCEBR-1 VF2	623	86
NCEBR-2 VF2	599	192

[1] Fruit size grade established by USDA, 5 x 6 lug arrangement for fruit diameter from 2 11/16 inches to 3 3/16 inches.

Plant Introductions Offer Valuable Watermelon Germplasm Resource

Watermelon germplasm from many areas of the world has been evaluated at Auburn during the past 2 years in a cooperative research project with the U.S. Department of Agriculture. This material represents a wide range of characteristics, including sources of insect and disease resistance, which should prove valuable in developing improved varieties.

Evaluations for resistance to gummy stem blight, anthracnose, and root-knot nematode were made during the 1988 growing season, with widely varying results noted. Ratings were made on a scale of 1 to 9 (1=resistant and 9=susceptible).

An introduction from Venezuela rated best for anthracnose resistance with a rating of 2.19. This one also rated good in gummy stem blight resistance (2.77), but was intermediate or worse for nematode resistance with a rating of 5.00.

The best rating for gummy stem blight resistance was 1.83 for an introduction from Zambia. This was combined with a rating of 4.00 for nematode resistance and 3.25 for anthracnose resistance.

Less resistance was found for root-knot nematodes in all the germplasms tested. The best rating came from a Zambia plant which rated 3.44. This germplasm was fairly well balanced, with ratings of 2.71 for gummy stem blight and 2.96 for anthracnose resistance.

J. D. NORTON

New Screening Technique May Lead to Mosaic Virus Resistant Southernpea Varieties

Blackeye cowpea mosaic virus (BlCMV) is a prevalent virus that limits production of cowpeas (southernpeas) in the Southeast. Resistance to BlCMV does exist in a limited number of cultivars, but needs to be expanded. For variety enhancement work to build on these BlCMV-resistant sources, two hurdles must be cleared: development of a reliable method to screen plants and discovery of the genetic mechanism that governs BlCMV-resistance.

Hope for resistant varieties has resulted from AAES research that has developed an efficient virus screening method which utilizes the enzyme-linked immunosorbent assay (ELISA). Plants to be tested are mechanically inoculated with BlCMV, evaluated for symptoms, and assayed for the presence of viral particles. Because this process is fairly rapid, a large number of plants can be surveyed over the course of a year. Screening to date includes part of the cowpea germplasm collection, AAES advanced breeding lines, and regional cooperative field trial entries.

Inheritance studies on BlCMV-resistant cultivars at the AAES have revealed that one gene confers BlCMV-resistance in cowpeas.

P.B. STRNISTE AND O.L. CHAMBLISS

EDITOR'S NOTE

Mention of company or trade names does not indicate endorsement by the Alabama Agricultural Experiment Station or Auburn University of one brand over another. Any mention of non-label uses or applications in excess of labeled rates of pesticides or other chemicals does not constitute a recommendation. Such use in research is simply part of the scientific investigation necessary to fully evaluate materials and treatments.

Information contained herein is available to all persons without regard to race, color, sex, or national origin.

Support Fruit & Vegetable Research

Funds appropriated by the Alabama Legislature provide the major financial support for Alabama Agricultural Experiment Station research. Hatch funds from the U.S. Government also represent an important funding source. Since these funds are limited, however, many areas of research would go unsupported except for financial support from various granting agencies, commodity groups, and other friends of the Experiment Station. Contributions of these supporters to the AAES program of research are acknowledged with gratitude. Among these supporters of AAES research, the following are recognized and thanked for their contributions to research on fruit and vegetable production:

Abbott and Cobb, Inc.
Abbott Laboratories, Inc.
Agplast Co.
Asgrow Seed Co.
Ethyl, Inc.
Ferry Morse Seed Co.
Harris Morgan Seed Co.
Hollar Seeds
I.B. Chemical Co.
ICI Americas, Inc.
Pinebloom Limited, Inc.
Roy Lee Smith Produce
SKW Trostberg Ag.
Tennessee Valley Authority
USDA-ARS, SE

Alabama Agricultural Experiment Station
Auburn University
Auburn University, Alabama 36849-0520

NON-PROFIT ORG.
POSTAGE & FEES PAID
PERMIT No. 9
AUBURN, ALA.