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Blueberry Research Progress Report

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Yarborough

1977

BLUEBERRY RESEARCH PROGRESS REPORT
Life Sciences and Agriculture Experiment Station

Prepared for the Blueberry Advisory Committee, March 10, 1977

OUTLINE OF RESEARCH REPORT

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EFFECT OF PLANT-WATER STRESS ON "LOWBUSH"
BLUEBERRY GROWTH, YIELD AND QUALITY

Personnel:

G. R. Benoit, W. J. Grant and Amr A. Ismail

Mission of Project:

To develop a water management system that will maximize blueberry production and reduce year-to-year fluctuations in yield.

Specific Objectives:

1. To determine the effect of duration and magnitude of plant-water stress on lowbush blueberry plant growth, fruit bud development, fruit set, yield and quality.
2. To determine the amount and timing of water required for optimum blueberry growth and yield under various soil and climatic conditions.

Status of Current Research:

A homogeneous set of rooted lowbush blueberry cuttings (from clone #4161) were established in the ARS greenhouse in 32, 6-gallon plastic buckets. The plants were arranged to give eight replications of four moisture treatment levels. An automatic subsurface irrigation system has been installed in each pot to insure maintenance of the desired soil moisture for each water treatment level. Research emphasis in the greenhouse phase of this project will establish water stress effects on the first year of blueberry's growth cycle.

Impact of Research:

This research will establish guidelines and requirements for water during each phase of the blueberries two-year growth cycle. The results will provide a means for maximizing and smoothing out blueberry yields.

Research Plans for 1977:

The greenhouse phase of the study will be continued. In addition a water level-fertilizer interaction study will be established in the field.

INSECTS AFFECTING THE BLUEBERRY

Personnel:

Howard Y. Forsythe Jr.

Mission of project:

Protect blueberry crop from loss due to insects.

Specific objectives:

- (a) To find more effective and less hazardous insecticides which are less damaging to the environment.
- (b) To determine the feasibility of utilizing trapping methods to monitor for blueberry maggot fly activity.
- (c) To study biology, ecology, and behavior of blueberry pests as necessary for development of control measures.

Status of current research:

Many insecticide tests for control of blueberry maggot and blueberry thrips were conducted in 1976. Excessive rainfall during the critical control period for thrips and low maggot populations generally resulted in inadequate control differences. Continued testing of insecticides and maggot fly traps is still essential to determine their performance under various environmental conditions. The registration status of some potential insecticide recommendations is poor. Locating insect-infested fields will probably be a limiting factor for all research in 1977. Extensive insect survey collections in blueberry fields in 1976 have not been completely examined and the insects have not been identified as yet.

Significant research accomplishment:

Essentially no thrips or maggot control data were obtained in 1976, for reasons noted above. Maggot fly trapping studies showed that a red ball located about two feet above the ground and adjacent to a bush on the north captured the most flies. A yellow cardboard trap hung horizontally to the ground also offered some potential.

Impact of Research:

Control of insect damage is essential for the commercial production of blueberries. Before new insecticides can be registered for use, the materials must be tested for method, rate and time of application, control effectiveness, residue and environmental hazards, effect on production and quality. Maggot fly trapping research can lead to a commercial use of a trap in determining the timing and necessity of a maggot insecticide spray, thus potentially reducing the use and cost of insecticides. Insect surveys in blueberry fields can aid in locating "minor" pests for which control tests can be conducted and in determining what potential pests might be present if changes in pruning practices are made.

Research Plans:

Minor pests: Search for infestations of insect pests that represent a potential hazard to blueberry production. When found, appropriate materials for control will be tested.

Blueberry Maggot: The following materials will be tested for efficacy, time, and number of applications:

Aerial Application

Trithion - rate of applications
Dylox - efficacy
Imidan - efficacy

Ground Application

Mesurool
Diazinon
Imidan
Dylox

Thrips: The following materials will be tested: Diazinon, Trithion, Malathion, and Imidan.

Insect traps: Continue testing maggot fly traps to determine critical populations and when and if insecticide applications should be made. Sufficient information is available to allow the preliminary testing of traps in commercial fields.

THE DEVELOPMENT OF BLUEBERRY VARIETIES
ADAPTED TO MAINE

Personnel:

Paul R. Hepler, Arlen D. Draper, Amr A. Ismail and John M. Smagula.

Mission of Project:

To develop blueberry varieties (low, high and/or intermediate) adapted to Maine, and to develop horticultural practices necessary for the culture of planted blueberries.

Specific Objectives:

1. To develop vigorous lowbush varieties with improved hardiness and good processing characteristics that could be used to either establish new plantings or improve the plant population of native stands
2. To evaluate blueberries of intermediate growth habit for processing production and develop suitable varieties.
3. To continue the development of winter-hardy highbush for the Market Garden and Home Garden primarily through the reevaluation of material already selected.
4. To improve methodology for evaluating winter injury as a predictive tool for the Industry and as a tool for evaluating breeding populations.

Status of Current Research:

A polycross of the Poplar Hill clones was made in 1976 and most of the Poplar Hill clones were also crossed to Me 4161. These nearly 200 seed lots are being germinated. Additional lowbush clones have been identified as potentially possessing genes for increased hardiness. One lowbush clone, Me 4161 and three highbush clones are currently under consideration for naming and release. Two clones are being propagated for large plot plantings to further evaluate planted lowbush culture.

Significant Research Accomplishment:

Potential productivity of the 100 Poplar Hill clones was estimated under conditions providing 100 percent pollination. The average yield was 6900 pounds per acre with a range from 300 to over 15,000. Since adequate nutrition was also afforded these clones, it was concluded (1) that the productivity of existing indigenous stands can be greatly increased and (2) that there is a great genetic variability in productivity among this random collection of native lowbush blueberry clones.

Fifty semi-randomly selected clones at Jonesboro tested for winter injury averaged 40 percent necrotic flower primordia with a range from 15 to 75 percent. Detailed variance analysis showed that the variance associated with fruit bud location on the stem accounted for the largest portion of the variance. The terminal bud for all clones averaged 70 percent dead flower primordia while the fifth bud had 29 percent necrosis. Maximum variability among the 50 clones occurred for bud 2, 3 and 4. These data suggest that the management of lowbush

blueberries should promote long unbranched stems rather than branched stems for minimal winter injury. Number of fruit per stem was negatively correlated ($r = -0.68$) with percent necrotic flower primordia, indicating that the technique of cutting dormant fruit buds and counting dead and live flower primordia will contribute toward a valid estimate of potential yield.

Winter injury was monitored weekly from the first week in November through April. Winter injury increased largely with time following several minimum temperatures below -10°F . The salt storm in early February 1976 had no noticeable effect on winter injury.

Research Plans for 1976:

A field planting of some test crosses of the Poplar Hill lowbush clones X Patriot and/or EW-3 will be made.

Progenies of the Poplar Hill Polycross and Poplar Hill clones X Me 4161 will be germinated and grown.

The Poplar Hill Clones and certain other lowbush clones will be crossed to Augusta.

Further work correlating winter injury, flowering, fruit set, and yield will be conducted.

Continue monitoring weekly the occurrence of winter injury from November through April on 2 cultivars.

WEED CONTROL IN BLUEBERRY FIELDS

Personnel:

Amr A. Ismail, Plant and Soil Sciences

Mission of Project:

To improve blueberry production and facilitate harvesting by developing new or improved methods of controlling weeds in blueberry fields.

Specific Objectives:

1. Evaluate herbicide materials for the control of grasses, sedges and flowering herbaceous weeds.
2. Evaluate herbicide materials for the control of woody weeds (lambkill, poplar, barrenberry, etc.), with emphasis on barrenberry control.
3. Develop equipment and methods for application of herbicides for selective or general control of various weed species in blueberry fields.

Status of Current Research:

1. Terbacil (Sinbar), Diuron (Karmex) and Terbacil and Diuron combination applied (under different fertility levels) for herbaceous weed control in blueberry fields have been evaluated during the past four years. The effect of these treatments on blueberry growth and yield are also being determined. Plots are located in 20 locations in 5 counties.
2. Aerial application of terbacil is being studied in ten locations to determine the effectiveness of this method of application. Ground spray equipment is also being evaluated to determine the most economical, effective and practical method that is adapted to the topography and conditions common in lowbush blueberry fields.
3. In progress are studies to determine the effectiveness of 2,4-D and Glyphosate (Round up) applied at different rates and on different dates for lambkill control. The effect of these treatments on blueberry plant stand, growth and yield are also being determined. Plots are located in TW19.
- 4- The effectiveness of different rates of glyphosate (Roundup) applied, with the newly designed roller, on different dates for barrenberry control is being assessed. The effect of these treatments on blueberry plant stand, growth and yield are being investigated. Plots are located in Spring Pond area, 2 locations.
5. The effectiveness of different rates of 2,4-D and Glyphosate (Roundup), following Des-I-Cate treatment, applied on different dates for barrenberry control is being studied. The effect of these treatments on blueberry plant stand, growth and yield are being determined. Plots are located in Centerville.

Significant Research Accomplishment:


1. Terbacil and Terbacil and Diuron mixture were found to be effective in controlling grasses, sedges and certain herbaceous weeds in lowbush blueberry fields and to significantly increase yield and ease of harvesting. Yields of 8,000(+) pounds per acre were obtained from treated areas. Findings from this research and other available information indicate that obtaining yields of 6,000-10,000 pounds per acre are quite possible from existing native lowbush blueberry fields with the adoption of certain cultural practices. Terbacil is now (1977) registered by EPA for use on blueberry fields.
2. Roundup was found to be effective in controlling practically all vegetation present in blueberry fields. Of great interest is its effectiveness in controlling barrenberry plants. This could be very effective if a method can be developed to apply material selectively without injury to blueberries.
3. A segmented weed roller, for selective application of herbicides, that uses an intermetting feeding system and a weed sensing device was designed, constructed and evaluated during the past three years. The roller could selectively apply an herbicide to plants taller than the blueberry plants. The new design facilitates closer adaptation to the contour of the land, thus, reducing injury to blueberry plants (on knolls); better drip control; considerably finer adjustments and better herbicide holding capacity on the revolving heads. A commercial size unit (9' 10" wide with 5 heads) was constructed at blueberry Hill Farm and demonstrated last summer. Growers acceptance has been excellent. Several similar machines of various sizes are presently under construction.
4. A system for barrenberry control has been proposed. The system utilizes high levels of fertility that cause differential height between barrenberry and blueberry stems, followed by selective application of herbicides using the improved roller. Preliminary evaluation of the system was very promising. This procedure is also effective for controlling other woody weeds.

Impact of Research:

This research provides essential information on the ability of certain herbicides to control specific weeds, and the effect on blueberry plants.

Blueberry growers will benefit by being able to control certain weeds in blueberry fields and improve their productivity, increase ease of harvest and improve the quality of the blueberry pack. The consumer should benefit by having larger quantities of better grade blueberries available (hopefully) at a lower price

Research Plans for 1977:

1. Evaluation of terbamil, and terbamil in combination with Diuron (In Progress): Plots established with several fertility levels at different locations in the State will be evaluated. The effectiveness of these treatments under different field conditions (soil types, weed population, blueberry plant stand, moisture, ) will be determined.
2. Time and method of application of Terbacil and Terbacil in combination with Diuron: Continue to evaluate effectiveness of aerial application. Also, to compare fall vs. spring application (ground) of terbamil and terbamil and diuron.
3. Barrenberry Control (In Progress): Emphasis in 1977 will be placed on evaluation of the effects of two herbicides (roundup and 2,4-D) on barrenberry control utilizing the newly developed roller in conjunction with high level of fertility to achieve additional height differential between barrenberry and blueberry stems. The effect of these herbicide treatments on other woody weeds will also be studied.
4. Lambkill Control (In Progress): Comparison of Roundup and 2,4-D at various rates and dates of application.
5. Construct and evaluate a small weed roller (herbicide applicator) especially designed to meet the needs of small growers.
6. Barrenberry plants propagated in 1974 and 1975 and transplanted into field plots in 1976 will be maintained for growth and physiological studies. Greenhouse studies will be conducted to determine barrenberry growth habits and response to herbicide.
7. The use of Infrared Photography will be further studied to explore possible adoption as a tool in assessing the effects of herbicides and other treatments on blueberry plants.

PRUNING OF BLUEBERRIES

Personnel:

Amr A. Ismail

Mission of Project:

To improve blueberry production, reduce energy consumption and pruning costs.

Specific Objectives:

1. Evaluate the effectiveness of various pruning methods (mechanical, thermal, chemical and electric) and time (fall and spring).
2. Determine the optimum method and frequency of pruning under various fertility and weed control treatments.

Status of Current Research:

Completed four years out of a five-year duration of the project. Underway are experiments to:

1. Determine and compare the effectiveness of burning (with oil and straw) and mowing in the fall or spring in combination with herbicide (terbacil) and fertility treatments.
2. Evaluate the effectiveness of electric shock as a pruning method. Compare electric treatment with burning and mowing for pruning.

Significant Research Accomplishment:

Burning is currently the most practical method of pruning blueberries but is costly and destructive of the organic material in the soil.

Impact of Research:

This research provides information on the effectiveness and practicality of various pruning methods. With proposed changes in management practices (particularly in weed control and fertility), it may be possible to reduce the frequency of burning (every 3, 4 or 5 years) or substitute another method for pruning.

Research Plans for 1977:

1. Evaluate the effect of electric shock treatments applied in 1975 on blueberry growth. Compare the effects of these treatments to those of burning and mowing on blueberry growth and potential productivity.
2. Initiate greenhouse and laboratory studies to provide an understanding of some of the basic effects of electric treatments on growth of blueberry plants.
3. Initiate studies to evaluate the effect of thermal and mechanical pruning treatment (burn vs. mow & fall vs. spring) on blueberry growth and yield.

INTEGRATED MANAGEMENT OF BLUEBERRY FIELDS

Personnel:

Amr A. Ismail

Mission of Project:

Develop an integrated program that will combine cultural practices to achieve maximum yield of blueberries with decreased cost per pound.

Specific Objectives:

1. To evaluate various combinations of weed control and fertility practices along with irrigation, pest management, and honey bees for pollination. The goal is to increase first crop production and possibly to produce an economical second year crop.
2. To identify cultural practices that encourage plant establishment and spread to increase plant stand.
3. To identify and establish plant growth habits and field conditions that will facilitate ease of mechanical harvesting.

Status of Current Research:

Plots have been established during the past two years. Several years will be needed to evaluate and determine the most desirable combinations of treatments and practices under different conditions (weather, fields, plants, etc.).

Significant Research Accomplishment:

Procedure for controlling certain weeds in blueberry fields under different fertility management has been identified. Effective weed control has been shown to be essential before a progressive fertility program may be adopted.

Impact of Research:

If a combination of chemical weed control, improved fertility and other practices can be proved effective, there should be a substantial increase in the yields per acre and a corresponding decrease in the cost per pound for producing and harvesting blueberries.

Research Plans for 1977:

1. Continue the weed control - fertility plots initiated in 1973 to determine the carry-over effect of herbicide and fertilizer applications.
2. Maintain management areas (5-20 acres at 5 locations in 2 counties) where herbaceous and woody weeds will be controlled, fertilizer applied and insects and diseases will be managed according to the latest research findings.
3. Establish management areas (5-10 acres at 3-5 locations) where cultural practices (weed control, fertilizing, pest control, etc.) leading to optimum production will be employed. Versions in pruning method (burn vs. mow) will be imposed on these trial areas.

THE PHYSIOLOGY AND BIOCHEMISTRY OF THE DEVELOPMENT
OF THE LOWBUSH BLUEBERRY FRUIT

Personnel:

Amr A. Ismail

Mission of Project:

Provide basic knowledge of the physiology and biochemistry of the maturation and ripening of the blueberry fruit that will be used to develop cultural practices that will improve quality and productivity of blueberries.

Specific Objectives:

1. To determine changes in quality related components (i.e. sugars, acids, etc.) as affected by various cultural and chemical treatments.
2. To determine the effect of various growth regulators on blueberry fruit set, development and quality.

Status of Current Research:

Little effort was devoted to this area in 1976.

Significant Research Accomplishment:

Certain physiological and biochemical changes occurring during the development of the lowbush blueberry fruit were delineated and described. The rates of respiration (CO₂ production) and ethylene evolution were determined. The blueberry fruit was found to be a climacteric fruit. Changes in amino acids, total nitrogen, protein nitrogen, soluble nitrogen, sugars, flavonols and anthocyanins during the development of the blueberry fruit were determined.

Impact of Research:

This research provided basic information that was not available in the literature. Better understanding of changes occurring during fruit maturation will enable researchers to determine desirable as well as undesirable treatments that may alter these patterns influencing fruit quality. It also could be used to determine optimum harvest date for maximum fruit quality, and to extend the harvest season, increase fruit set and improve quality.

Research Plans for 1977:

Study the effect of certain growth regulators (GA & BA) on fruit set, development and quality.

Gibberellic Acid -
benzyladenine - synthetic cytokinin

SURVEY OF RED LEAF DISEASE OF BLUEBERRIES

Personnel:

D. C. McGee

Mission of project:

To determine the significance of red leaf disease, as a factor in reducing yield of blueberries.

Specific objectives:

To determine the distribution and severity of red leaf in the major blueberry growing areas.

Status of current research:

A method was developed in 1976 to quantitatively estimate the severity of red leaf in blueberry fields. A survey was then made of fields chosen at random. In the Barrens region, red leaf was detected in 8 fields out of 14 and the maximum level of infection found was 0.4%. In the coastal region of Eastern Maine 8 fields were surveyed; the disease was detected in all fields and the average level of infection 1.9%. Since seasonal conditions could have some effect on disease severity, this survey should be continued for at least one more year.

Significant research accomplishment:

In 1976, losses from red leaf in the Barrens were shown to be insignificant. The disease was more severe in the coastal region, but losses were still minor.

Impact of research:

By accurately estimating the effect of red leaf on blueberry production, it will be possible to determine whether control measures are necessary.

Research plans for 1977:

Continuation of the survey started in 1976.

BLOSSOM BLIGHT OF BLUEBERRIES

Personnel:

D. C. McGee

Mission of project:

To improve methods of control of blossom blight of blueberries.

Specific objectives:

1. To test the efficacy of new fungicides in control of blossom blight and compare them to those presently recommended.
2. To establish the relative importance of the fungi Botrytis spp. and Monilinia spp, as causal agents of the blossom blight condition in Maine.

Status of current research:

Fungicide trials were located at sites in Centerville and Jonesboro in 1976. Due to dry conditions during the blossom period, blossom blight infection was not severe enough to allow any estimate of disease.

Plants with blossom blight symptoms from various locations were examined and found to be infected with either Botrytis or Monilinia.

Significant research accomplishment:

Previous work suggests that Botrytis spp. is the major causal agent of blossom blight. However, the results of 1976 indicate the Monilinia spp. may also be a significant pathogen of blueberry blossoms.

Impact of research:

1. Improved methods of fungicidal control of blossom blight will become available.
2. By determining the relative importance of Botrytis spp. and Monilinia spp. as causal agents of this disease, control measures can be recommended specific to the appropriate pathogens.

Research plans for 1977:

1. Continue fungicide trials, locating them at experimental sites where high humidity is likely to prevail during blossom.
2. Determine the occurrence of Botrytis spp. and Monilinia spp. by surveying fields where blossom blight occurs.

BLUEBERRY MARKETING AND COST ANALYSIS
OF PRODUCING BLUEBERRIES

Personnel:

Homer B. Metzger, Amr A. Ismail

Mission of Project:

To develop economic information useful to the blueberry industry and potential growers in making management decisions about producing and marketing blueberries.

Specific Objectives:

1. To determine the feasibility of marketing fresh blueberries.
2. To make a cost analysis of practices used in producing and harvesting blueberries.

Status of Research:

The research project terminated June 30, 1976. Published results of costs and returns in the experimental fresh blueberry marketing of 1974 and the cash costs of producing blueberries in 1974 were released in January 1977.

Detailed total costs and returns in blueberry production for 27 growers have been prepared in manuscript form which is under review for publication.

Significant Research Accomplishment:

The average cost for producing and harvesting blueberries was \$182 per acre. With a yield of 675 pounds per acre the cost per pound amounted to 34 cents. Nearly half the growers had costs ranging between 17 and 25 cents per pound. Variable costs amounted to 21 cents per pound and fixed costs 13 cents per pound. Cash costs were 18 cents per pound. Total costs per pound declined substantially as yield per acre increased, averaging 51 cents for low yields (212 lbs.) and 21 cents for high yields (1217 lbs.). Size of operation also influenced costs per pound, averaging 37 cents for small size (10 acres or less) and 29 cents for large size (over 75 acres) operations. No significant differences in overall costs were indicated between those growers contracting for services and those performing services themselves.

Blueberry growers recovered cash costs and most of the variable costs of producing and harvesting the 1974 crop. For a competitive return on invested capital and a modest wage the average grower would have had to receive 35 cents rather than 20 cents per pound under the yields obtained in 1974. To be reasonably assured of adequate returns, a grower should achieve yields of over 1000 pounds per acre.

Impact of Research:

Growers are apprised of the total cost situation in blueberry production which should be useful in making decisions.

The financial position of blueberry growers and the necessity for developing sizeable, high yielding operations are amply demonstrated in the research results.

Research Plans for 1976:

No further effort beyond publication of results.

FACTORS REGULATING RHIZOME INITIATION AND
DEVELOPMENT IN THE LOWBUSH BLUEBERRY

Personnel:

Project Leader: - Dr. John M. Smagula
Cooperators: - Dr. Stewart Goltz, Dr. Paul Hepler,
Dr. Alan Langille

Mission of Project:

To develop an effective method of accelerating rhizome initiation and growth that will permit more intensive management and increased yields from natural and cultivated blueberry fields.

Specific Objectives:

- a. To develop a method for in vitro culturing of lowbush blueberry tissue.
- b. To investigate the role of growth regulators in rhizome initiation and development.
- c. To study the effect of soil temperature on rhizome initiation.
- d. To study nutritional responses of the lowbush blueberry related to growth habit, particularly rhizome production.
- e. To examine the feasibility of leaf-bud cuttings as a means of more efficiently propagating lowbush blueberry clones.

Status of Current Research:

- a. Lowbush blueberry callus tissue has been successfully cultured in vitro. Sub-culture of callus has been accomplished and shoot regeneration is currently under investigation.
- b. Callus tissue will be used to study the effect of growth regulators on shoot initiation and subsequently rhizome initiation.
- c. A differential response in rhizome production to different soil temperatures was noted in preliminary work with lowbush blueberry seedlings. Additional studies are planned to substantiate these findings.
- d. Dormant rooted cuttings with higher levels of nitrogen in their stem tissues did not produce more rhizomes when grown under greenhouse conditions for seven weeks. However, when plants were grown in Jonesboro under field conditions for six months, rhizome production was enhanced.

- e. Lowbush blueberry plants were propagated by leaf bud cuttings from four clones under greenhouse conditions. No differences were noted among cuttings taken at tip dieback and at three consecutive one-week intervals after tip dieback. Cuttings taken from the top or middle of the stem were more successful than those taken from the lower portion. A shield type cutting was more effective than a mallet in producing plantlets.

Significant Research Accomplishments:

- a. Lowbush blueberry tissue has been cultured successfully in vitro.
- b. Fertilization of cuttings during rooting has significantly improved growth and rhizome production under field conditions.
- c. Lowbush blueberries have been successfully propagated using leaf bud cuttings from the middle and upper portion of the stems at tip dieback.

Impact of Research:

- a. The development of a method to stimulate rhizome production will have significant influence on existing fields and newly planted fields. The slow spread of the lowbush blueberry is a major hurdle in the establishment of fields of high yielding clonal material.
- b. The practice of fertilizing lowbush blueberry cuttings during rooting has been shown to produce a significantly better plant for newly established fields.
- c. Leaf bud cuttings may provide a more efficient method of rapidly increasing a limited supply of clonal stock for research and field trials.

Research Plans for 1977:

- a. Refine techniques for producing callus tissue in vitro. Investigate the effect of growth regulators on shoot and rhizome initiation using tissue cultures.
- b. Investigate yield year application of nitrogen fertilizer to enhance second year crop.
- c. Continue soil temperature studies.
- d. Further investigation of propagation by leaf-bud cuttings will concentrate on the use of growth regulators to enhance bud release, reduce the time of plantlet formation and to increase the percent success.

NEW FOOD PRODUCTS AND SERVICE

Personnel:

Ruth H. True, Assistant Food Scientist, Department of Food Science; Howard Y. Forsythe, Jr., Associate Professor of Entomology, Department of Entomology; and Amr A. Ismail, Maine Blueberry Professor of Horticulture, Department of Plant and Soil Sciences.

Mission of Project:

To evaluate the effects of various field cultural and chemical treatments and processing procedures on the flavor and quality of blueberries.

Specific Objectives:

1. To identify cultural and chemical treatments that enhance the flavor and quality of blueberries.
2. To obtain data as required by FDA for the registration of pesticide material for use on blueberries.

Status of Current Research:

None was in progress in 1976.

Significant Research Accomplishment:

The effects of a foreign berry (barrenberry) on the flavor and acceptance of blueberry muffins and pies were determined. The effects of Imidan 50-WP (an insecticide), Trithion 3%-D (an insecticide), and Terbacil (Sinbar 80%-WP, an herbicide) treatments on blueberry flavor and acceptance by taste panels were delineated.

Impact of Research:

Delineate cultural and chemical treatments that provide better quality blueberries. Provide data required for registration of pesticides for use on blueberries.

Research Plans for 1977:

As needs are identified by cooperating researchers.