Michigan Blueberry I.P.M. Update

May 15, 2007 Volume I, No. 5

## Contents



The Blueberry IPM Update is a weekly publication produced by Michigan State University Extension. To receive a copy of this newsletter, send an email to masonk@msu.edu.
Also available online through blueberries.msu.edu and at:
www.isaacslab.ent.msu.edu/blueberryscout/blueberryscout.htm

## CROP STAGES

In Van Buren County, Jersey in Covert are at 75% bloom. Blueray and Bluecrop are at full bloom in Grand Junction. In Ottawa County, Blueray are at 50% bloom and Jersey are at 10% bloom in Holland. Rubel and Bluecrop are both at 25 to 50% bloom in West Olive.

Bluecrop at 25% bloom in West Olive

## DEGREE DAYS AND WEATHER NOTES

Weather Forecast: Temperatures will be a litttle cooler this week. Chance of showers and thunderstorms Tuesday and Wednesday. By 5-21 $GDD_{50}$ will increase by ~60, and $GDD_{42}$ will increase by ~105. Complete weather summaries and forecasts are at available enviroweather.msu.edu

| GDD (from March 1) | Base 42 | Base 50 |
|---|---|---|
| | **Van Buren County** | |
| **4-30** | 474 | 237 |
| **5-7** | 605 | 315 |
| **5-14** | 735 | 400 |
| | **Ottawa County** | |
| **4-30** | 368 | 170 |
| **5-7** | 479 | 232 |
| **5-14** | 628 | 328 |

**Editor's Note:** We hope you find the information in this newsletter useful in guiding what to look for as you scout your own farm. The scouting data shown in the Disease and Insect Updates below are taken from four Michigan blueberry farms. As conditions are different from farm to farm, we must stress that the information in this newsletter should not be used as a substitute for scouting your own fields. Your spray decisions should be made based on what is seen on your own farm.

Please use this newsletter to determine when and how to look for certain pests, identify potential pest problems, and to get information on the biology of pests and other aspects of integrated pest management. See the Insect and Disease Updates below for descriptions of some scouting methods that can be used on your farm. These scouting methods will also be demonstrated at the Blueberry IPM Scouting Workshops on June 13:

**BLUEBERRY IPM SCOUTING WORKSHOP**
**June 13, 2007**

**10-12am at the Bodtke Farm, Grand Junction**

**3-5pm at Carini Farms, West Olive**

## NITROGEN FERTILIZATION FOR OPTIMAL BLUEBERRY PRODUCTION

Eric Hanson, MSU Small Fruit Specialist
Mark Longstroth, MSUE District Extension Educator

Most Michigan blueberries require nitrogen (N) annually for good production, but using the right rate is important. Too little N reduces blueberry vigor and yield, whereas too much can do the same as well as increase winter injury. Careless use of N wastes money and can pollute groundwater or streams and ponds. So, how do you know you are applying the right amount?

First, start with the recommended amounts in the table below. Second, apply N properly. This is best done by applying half the N a couple weeks prior to bloom and half at the end of petal fall. Avoid fertilizing early in the spring (plants can't use it) or in the late summer or fall (may reduce hardiness). Third, collect leaf samples in the middle of the summer and have these analyzed for nutrient content. Leaf N levels will then tell you whether rates for your specific fields need to be adjusted up or down. Leaf N below 1.7% indicates

rates should be increased; reduce rates if levels are higher than 2.3%. Sample at least 50 leaves from different bushes in late July to early August. Collect Select healthy leaves from the middle of this year's shoots. If the leaves are dusty, rinse them briefly in tap water, spread them on a table top until they are dry to the touch, package them in paper bags, and send thee bags to a reputable laboratory.

Recent increases in N fertilizer costs have changed may make some organic sources of N economical. Conventional N fertilizers cost about $0.50 (urea) to $.75 (ammonium sulfate) per lb of N. By contrast, composted poultry (2-3% N) and dairy (1% N) manure may cost $0.70-1.60 per lb of N. Compost costs more to spread, and only about half of the N is available in the year of application, but they contain other nutrients and organic matter, and may benefit overall soil health. Fresh manure is usually an even cheaper source of N, but this may be a source of microbial contamination of fruit if it is applied in the spring or early summer.

Another concern in choosing N fertilizers is the soil pH of your field. If the soil pH is less than 5 then urea is a good choice. If the soil pH is above 5, then ammonium sulfate is a more acidifying fertilizer and will help lower the soil pH.

**Nitrogen Recommendations for Michigan Blueberries (lb/acre).**

| Age (years) | N | Urea | Ammonium sulfate |
|---|---|---|---|
| 2 | 15 | 35 | 75 |
| 4 | 30 | 70 | 150 |
| 6 | 45 | 100 | 215 |
| 8 | 65 | 150 | 300 |

## PEST OF THE WEEK- *Hoplia* flower beetles

### What are those beetles, chewing on my flowers?

Rufus Isaacs, Entomology

The warm weather over the past few weeks has brought out one of the earliest scarab beetles we find in Michigan blueberry fields. This species is a *Hoplia* flower beetle and the adults feed on young buds and also on flowers. They prefer white flowers and are attracted to blueberry, leaving ragged holes in the flower from their feeding. We have also trapped these beetles in the white monitoring traps used for fruitworms.

These beetles are distinctive because they have marks on each elytra (wing covering) and are a little hairy. This distinguishes them from rosechafer or Japanese beetle. *Hoplia* beetles may be tan or grey and they are usually here for just a short time especially in hot weather. It is not known how much economic damage they do, but the number of flowers or buds affected is usually a very small percentage of the total number. We also do not know whether damaged buds or flowers can still set fruit.

***Hoplia* beetle on blueberry flowers, viewed from the rear**

## DISEASE UPDATE

Timothy Miles and Annemiek Schilder
Department of Plant Pathology, Michigan State University

### Mummy Berry

**This past week the majority of mummy berry apothecia appeared dried up. However, shoot strike infections were found in each of the scouted plots. The most shoot strikes were found in the site with the most apothecia. Since it takes about two weeks from infection for symptoms to show, shoot strike numbers will still likely increase. In addition, flower strikes were also found. Both shoot and flower strikes are sources of infectious spores for fruit infection. Good pollinating weather increases the risk of fruit infection as bees serve as carriers of infectious spores when they move from infected shoots to susceptible flowers (Fig. 1).**

| Farm | Date | Mummified berries per bush* | % germinated mummified berries | Mummy berry mushrooms per bush* | Mummy berry shoot strikes per bush | Mummy berry flower strikes per bush | Phomopsis twig blight per bush |
|---|---|---|---|---|---|---|---|
| **Van Buren County** | | | | | | | |
| **Covert** | 4-30 | 0.8 | 12 | 0.1 | 0 | 0 | 0 |
| | 5-7 | 0.7 | 29 | 0.2 | 0 | 0 | 0 |
| | 5-14 | 0.25 | 0 | 0 | 2.8 | 0 | 0.1 |
| **Grand Junction** | 4-30 | 58 | 17 | 12 | 0 | 0 | 0 |
| | 5-7 | 55 | 6 | 6 | 0 | 0 | 0 |
| | 5-14 | 36 | 0.3 | 0.1 | 29.1 | 0.4 | 0 |
| **Ottawa County** | | | | | | | |
| **Holland** | 4-30 | 22 | 14 | 6 | 0 | 0 | 0 |
| | 5-7 | 19 | 2.5 | 1 | 0 | 0 | 0 |
| | 5-14 | 12 | 3.4 | 0.8 | 7.2 | 0 | 0 |
| **West Olive** | 4-30 | 6 | 33 | 4 | 0 | 0 | 0 |
| | 5-7 | 7 | 6 | 0.6 | 0 | 0 | 0 |
| | 5-14 | 4.35 | 0 | 0 | 3.4 | 0 | 0 |

* The numbers in this table are the average number of mummies in 18 sq ft area of soil at the base of each of 5 bushes spread out in a row.

**Since all of the fields were at least at 25% bloom, fungicide sprays to prevent fruit infection are recommended. Systemic fungicides such as Indar or Pristine are best, since we are trying to protect the flower stigma from infection. The spores germinate on the stigma and then the fungus grows alongside the pollen tubes through the pistil into the ovaries. Individual flowers are most susceptible right after they open and susceptibility decreases over time (Fig. 3). Once the fungus reaches the ovaries, it colonizes in the developing berry. This infection is not noticeable while the fruit is still green but can be seen as white fungal growth once the berries are cut open (Fig. 2).**

Figure 1. Bees and other insects can visit the shoot or flower strikes and carry the mummy berry spores to open flowers

Figure 2. White fungus mass of mummy berry fungus growing inside green fruit. This can only be seen if the berry is cut open.

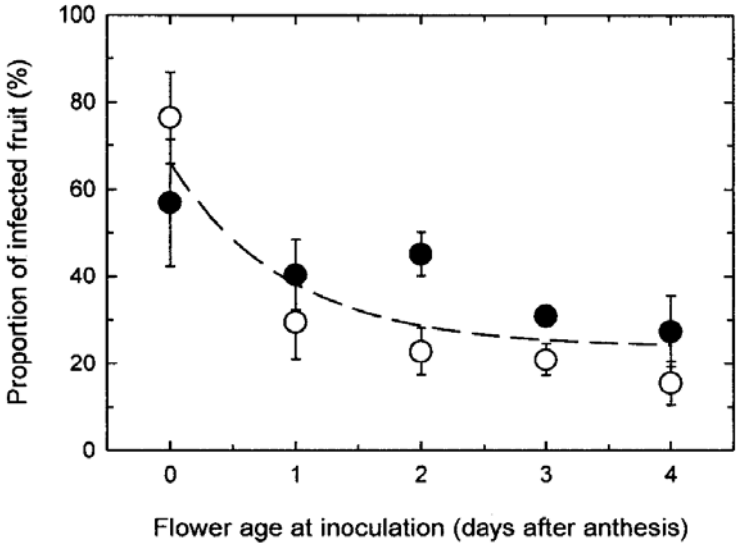


Figure 3. Susceptibility of blueberry flowers to infection by *Monilinia vaccinii-corymbosi*. From: Ngugi, H K., H Scherm, and J S. Lehman. 2002. Phytopathology 92:1104-1109.

**How to scout for mummy berry shoot strikes**:
To scout for shoot strikes, pick five bushes and record the number of shoot strike infections per bush. Shoot strikes can be identified by the brown oak leaf pattern along the veins of wilting leaves and a layer of gray powdery spores on the upper part of the leaf and petiole. Also, shoot strikes generally do not exhibit browning of the wood beyond the green tissue of the infected shoot. Flower strikes may be distinguished from other blights by the dense gray spore masses on the flower stem. Flower strikes are much less common than shoot strikes and would not usually be present in the absence of shoot strikes. Some cultivars are more susceptible to shoot strikes/flower strikes and less susceptible to fruit infection, whereas others are just the opposite. Susceptible varieties include Berkeley, Jersey, Bluetta, Blueray, Rubel, Bluehaven, and Northland.

## Phomopsis Twig Blight

Phomopsis twig blight is caused by the fungus *Phomopsis vaccinii*. This disease occurs in most blueberry-growing regions and is present at low levels in most fields. In some years and locations, twig blight can be severe, with over 100 blighted twigs per bush. The reasons for the outbreaks are not clear but appear to be correlated with frequent or prolonged rains or irrigation events during bloom. Cultivars Jersey and Berkeley are particularly susceptible to Phomopsis twig blight. Bluecrop appears more susceptible to Phomopsis infection of newly developing canes.

Symptoms of twig blight include dark brown lesions and death of young twigs (Fig. 1, 2) and collapse of flower and fruit clusters on diseased twigs (Fig. 3). The lesions may extend up to several inches from the tip of the twig and there may be more than one lesion per twig. The lesions initially grow fairly rapidly (up to an inch per week), then eventually stop expanding. In some cases, lesions can be seen surrounding dead buds (Fig. 4). These buds may have been infected the previous summer or fall. In the spring, the fungus colonizes and kills the infected bud and then grows into the stem tissues. Phomopsis twig blight may be difficult to distinguish from other diseases that can kill flower clusters, such as mummy berry, Botrytis, and anthracnose. The presence of a spreading dark brown lesion is indicative of Phomopsis, but may also be anthracnose. If in doubt, apply a fungicide that is effective against

*Phomopsis vaccinii* overwinters in dead twigs and canes infected during the previous year(s) (Fig. 5). Fungal fruiting bodies may be seen with the naked eye of with a hand lens in bleached areas as small pimples on the surface of the bark (Fig. 6). Once the weather warms in the spring and the twigs are sufficiently wetted by rain or irrigation water, spores are released from these fruiting bodies and are dispersed by rain and irrigation water. The majority of *Phomopsis* spores are released between bud break and bloom and infect young twigs and the tips of young green canes as they develop. Young, succulent tissues are most susceptible to infection. Older canes may be infected through wounds.

Bloom is an important time to protect blueberry twigs and young canes from new infections (if most twig lesions are surrounding dead buds, these may be from fall infections which cannot be cured at this point). The most effective fungicides against Phomopsis are Indar, Topsin M + Ziram (or Captan), Pristine, and Cabrio. The protectant fungicides Bravo and Ziram (4 lb) are also effective but may need to be re-applied after heavy rain. Bravo should not be applied after the start of bloom to avoid phytotoxicity to blossoms.

Fig. 1. Blueberry twig with Phomopsis twig blight symptoms (Photo by Phillip Wharton, MSU)

Fig. 2. Phomopsis twig blight lesions on vegetative twig.

Fig. 3. Flower cluster killed by Phomopsis twig blight (note necrotic stem below cluster).

Fig. 4. Phomopsis twig blight lesion developing from infected bud, which was killed in the process.

Fig. 5. Old infected twig: Spores are produced in bleached areas on twig.

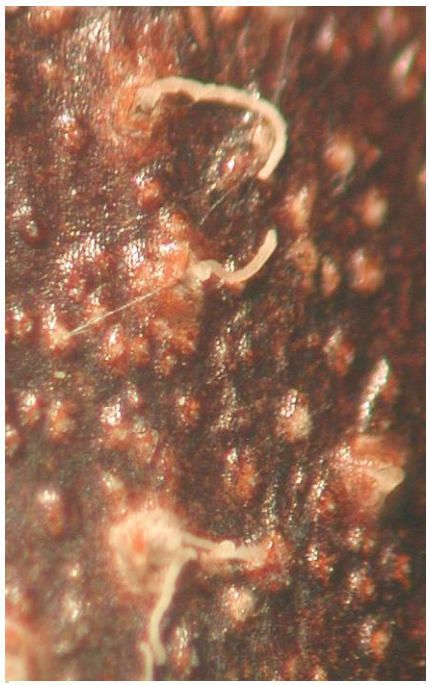

Fig. 6. Cream-colored sticky spore masses exuding from fruiting bodies on twig killed by Phomopsis (photo by Pam Fisher, OMAF, Canada).

**How to scout for Phomopsis twig blight:**

To scout for Phomopsis twig blight, pick five random bushes spread out in a row and look for recent browning and death of young twigs and collapsing flower/fruit clusters. Twig lesions may originate from infected buds which subsequently die. If extensive twig blight and dying flower clusters are seen (more than 20 newly infected twigs per bush) fungicide applications, especially during a wet spring should be considered.

## INSECT UPDATE

### FRUITWORMS

**The first cranberry fruitworm was caught in Grand Junction and at an Allegan county farm on Monday this week. Cherry fruitworm moth catches are increasing. Traps for these moths should already be set and checked weekly until harvest. The "contaminant" moth, *Pseudexentra vaccinii* was not caught in CFW traps, and we suspect the flight of this moth is ending. In the next week, we expect Cherry fruitworm and cranberry fruitworm captures to increase, and we expect the first cherry fruitworm eggs to be laid in Van Buren County. Control of these pests can be achieved during bloom using Confirm or B.t.**

**Click here for more info and photos of cranberry and cherry fruitworm.**

### LEAFROLLERS

**An obliquebanded leafroller larva was observed at the Grand Junction farm. These larvae are green with a brown head capsule. Continue to scout your bushes for these larvae and their damage and Click here for more information on Obliquebanded leafroller. Specific insecticide treatment for this pest is usually not required as insecticide sprays targeting fruitworms are usually effective at controlling early season leafrollers.**

### BLUEBERRY TIP BORER

**This pest, also known as the blueberry gall midge, was detected at the Holland and Covert farms. Click here for more information about blueberry tip borer.**

### MONITORING FOR FRUITWORMS

To monitor for Cranberry fruitworm (CBFW) and Cherry fruitworm (CFW) use pheromone baited traps. For each species, use one Large Plastic Delta Trap (LPD) w/ the appropriate sex pheromone lure pinned to the inside of the roof of the trap. Attach the trap to the outer canopy of the upper third of a blueberry bush on the field border. Traps should be hung adjacent to woods in "hot spots" where damage has been noted in the past. Set traps at least 30ft apart in mid to late April. Check traps weekly, record the number of moths caught. Remove moths from the sticky trap insert and replace sticky insert as needed. Traps are available from Great Lakes IPM **http://www.greatlakesipm.com/.**

After moths are caught and after petal fall (~5-15 or 5-30) bushes should be inspected for eggs and damage each week for a five minute sampling period. Working in a "hotspot," look at as many fruit clusters as possible on 10 to 20 bushes along the field border. Looking at the fruit clusters can help you find eggs in calyx cup, larvae entry holes and damage. When inspecting the fruit grasp the cluster and view with the sun over your shoulder. Carefully turn the clusters over and inspect the bottom of the fruit as well as the top for entry holes and/or frass. Record the number of cranberry fruitworm and cherry fruitworm eggs and the number of berries with damage. See the article below for pictures and more info.

### SCOUTING FOR APHIDS

Begin scouting for blueberry aphids in early to mid May. Look at 2 shoots of new growth at the base of 10 bushes and check for the presence of aphids on the underside of the leaves. As the season progresses, you should look for parasitized aphids (mummies). Record the number of shoots with aphids on the 10 bushes – 2 shoots per bush (multiply by 5 to get % infested shoots). Do the same for aphid mummies. If aphids are found on varieties that are susceptible to shoestring virus, insecticides may be needed for control. For more info on blueberry aphids, see the Pest of the Week section above.

| Van Buren County | | | | | | |
|---|---|---|---|---|---|---|
| Farm | Date | CBFW moths per trap | CFW moths per trap | Blueberry aphid % infested shoots | Blueberry maggot per trap | Japanese beetle per 20 bushes |
| **Covert** | 4-30 | 0 | 0 | - | | |
| | 5-7 | 0 | 2 | 0 | | |
| | 5-14 | 0 | 10 | 0 | | |
| **Grand Junction** | 4-30 | 0 | 0 | - | | |
| | 5-7 | 0 | 0 | 0 | | |
| | 5-14 | 1 | 0 | 0 | | |
| **Ottawa County** | | | | | | |
| **Holland** | 4-30 | 0 | 0 | - | | |
| | 5-7 | 0 | 0 | 0 | | |
| | 5-14 | 0 | 0 | 0 | | |
| **West Olive** | 4-30 | 0 | 0 | - | | |
| | 5-7 | 0 | 0 | 0 | | |
| | 5-14 | 0 | 8 | 0 | | |

## USING DEGREE DAYS IN BLUEBERRY IPM PROGRAMS

**Rufus Isaacs and Keith Mason, MSU Entomology**

Degree days can be a very useful tool for blueberry scouts, consultants and growers, because they help predict when important stages of pests will occur. A degree day (DD) is a measure of developmental time for insects, with more DDs accumulating on hot days than on cold days. Because insects develop based on the temperature, knowing the number of growing degree days can help you predict when it is best to put up traps, when to scout for insects, and when to spray if needed. DDs also balance out the differences between years in when pest events occur. Cranberry fruitworm might lay eggs in late May in a hot spring but this may not happen until mid June in a cool year. By keeping track of DDs, growers can target pest events with greater accuracy and can also predict when certain events are expected to occur in the near future.

To calculate the number of DDs accumulated each day, you need to know the minimum and maximum temperature for the day, and also the base temperature to count from. Many blueberry insect pests develop only above 50F, and so their base temperature is 50. Others may develop starting at 42F. As an example, if a day starts at 40F and reaches 70F as the maximum, then an insect with a base temperature of 50F would accumulate 70-50 = 20, divided by 2 = 10 degree days. A simple min-max thermometer can be used to keep track of this, and it is best to have information from your own farm. There are also automated systems that MSU provides for free that can provide the latest degree day information at the touch of button.

One of these automated weather systems is the Enviroweather system. To access this weather information, go online to http://www.enviroweather.msu.edu/home.asp. This keeps track of DD at for about 50 weather stations across Michigan at base 32, 40, 42, 45, and 50. To access these numbers, enter the website and click on the yellow dot nearest to your farm. Then in the "Weather Observations…" box, click on "Weather summary….". This will bring up the page of DD totals and you can scroll down to see the total for yesterday.

The table below provides some DD predictions for key blueberry insect pests. This information was generated from MSU weather stations near to six commercial blueberry farms that were scouted weekly for pest insects from 2003 to 2006. Values presented here are the degree day values when specific pest events occurred, averaged across those farms and across the years. Blueberry pest information is available online at www.blueberries.msu.edu.

We stress that our table contains predictions, and are not validated models. This table will also be expanded as we gather more information on other pests. If you are trapping and also tracking DD in your area, your feedback on the accuracy of these values would be greatly appreciated. Please send comments to Keith Mason at masonk@msu.edu .

## AVERAGE DATE AND DEGREE-DAYS OF BLUEBERRY INSECT PESTS

| EVENT | Date first seen | | GDD 42 | GDD 50 |
|---|---|---|---|---|
| | Van Buren | Ottawa | | |
| **GROWTH STAGES** | | | | |
| Bud break | April 17 | April 18 | 224 | 108 |
| Bloom | May 14 | May 15 | 591 | 310 |
| Petal fall | May 27 | May 28 | 768 | 407 |
| First harvest | July 15 | July 15 | 2060 | 1313 |
| **Cherry Fruitworm moths** | | | | |
| first | May 10 | May 10 | 511 | 262 |
| peak | May 28 | May 30 | 804 | 431 |
| end | June 12 | June 16 | 1180 | 683 |
| **CFW eggs** | | | | |
| first | June 1 | June 2 | 872 | 472 |
| peak | June 9 | June 9 | 1074 | 612 |
| end | June 21 | June 18 | 1337 | 797 |
| **Cranberry Fruitworm moths** | | | | |
| first | May 24 | June 1 | 758 | 412 |
| peak | June 16 | June 17 | 1267 | 747 |
| end | July 17 | July 11 | 2018 | 1285 |
| **CBFW Eggs** | | | | |
| first | June 6 | June 11 | 1235 | 732 |
| peak | June 9 | June 13 | 1264 | 776 |
| end | June 19 | June 15 | 1401 | 856 |
| **Blueberry Aphid** | | | | |
| first | June 5 | June 4 | 949 | 525 |
| peak | July 4 | July 4 | 1715 | 1062 |
| end | August 8 | August 13 | 2804 | 1853 |
| **Parasitized aphids** | | | | |
| first | June 29 | June 23 | 1503 | 904 |
| peak | August 4 | July 30 | 2571 | 1692 |
| end | August 28 | August 13 | 3314 | 2246 |
| **Obliquebanded leafroller moths** | | | | |
| **OBLR Generation 1** | | | | |
| first | June 15 | June 14 | 1208 | 695 |
| peak | July 1 | June 28 | 1607 | 994 |
| end | July 29 | July 28 | 2434 | 1600 |
| **OBLR Generation 2** | | | | |
| first | August 18 | August 12 | 2968 | 1986 |
| peak | September 6 | September 7 | 3574 | 2396 |
| end | September 27 | September 30 | 3980 | 2666 |
| **Japanese beetle adults** | | | | |
| first | July 4 | July 15 | 1908 | 1211 |
| peak | August 14 | August 11 | 2738 | 1832 |
| end | September 4 | September 1 | 3452 | 2319 |

## UPCOMING MEETINGS

**May 17 - Blueberry IPM Scout Training, Hands-On Workshop**
Meet at 1 pm at Trevor Nichols Research Complex in Fennville, then drive to blueberry farm

**June 13 - Blueberry Scouting and IPM Demonstration Workshops**
10-12am at Bodtke Farm, Van Buren County
3-5pm at Carini Farms, Ottawa County

## MSU BLUEBERRY TEAM

Horticulture - Eric Hanson
Plant Pathology - Annemiek Schilder
Entomology - Rufus Isaacs
Trevor Nichols Research Station - John Wise
Van Buren Co. - Mark Longstroth
Ottawa Co. – Carlos Garcia
Berrien Co. - Greg Vlaming
Southeast Michigan – Bob Tritten

For more information, see our website at blueberries.msu.edu

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This publication is also available online through blueberries.msu.edu, and at: http://www.isaacslab.ent.msu.edu/blueberryscout/blueberryscout.htm .

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