



## ***The BLUEBERRY BULLETIN***

*A Weekly Update to Growers*

**Dr. Gary C. Pavlis, County Agricultural Agent**

**6260 Old Harding Highway, NJ 08330**

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**April 9, 2012**

**Vol. XXVIII, No. 3**

***At a glance. Insect and disease problems that should be considered this week.***

<b>PEST/DISEASE/CULTURE</b>	<b>APRIL 11-18 BEGIN BLOOM</b>	<b>APRIL 19 -26 FULL BLOOM</b>
MUMMY BERRY  Abound, Indar, Quash	Blueberries are still susceptible to primary infections. Scout for cups in wet areas. Strikes should start to be visible by April 10.	Continue scouting for strikes. Applications as necessary
ANTHRACNOSE  Abound, Cabrio, Captan, Omega, Ziram	Begin applications when the flower clusters have expanded and flowers are greater than 20% open. Follow with a second application 7-10 days later	
PHOMOPSIS	No further action required	
PHYTOPHTHORA ROOT ROT  Phosphite fungicide or Rodomil	Have plants tested for Phytophthora root rot and apply appropriate fungicides for control.	
MOTH LARVAE – LEAFROLLERS, SPANWORMS	Scout flower clusters for “worm” activity.	Treat w/ Bt’s or Intrepid/Confirm if over 1 larva per 100 flower clusters.
NUTRITION	First application of N-P-K should be applied at this time.	

### **BLUEBERRY TWILIGHT MEETINGS**

**TUESDAY, APRIL 24, 2012 @ 5:30**  
**ATLANTIC BLUEBERRY CO**  
**7201 WEYMOUTH RD., HAMMONTON, NJ**  
**FOR DIRECTIONS, CALL 609-561-8600**

**TUESDAY, MAY 29, 2012 @ 5:30**  
**PHILIP E. MARUCCI RESEARCH CENTER**  
**125A LAKE OSWEGO RD.**  
**CHATSWORTH, NJ**  
**FOR DIRECTIONS, CALL 609-726-1590**

### **CULTURE**

**Dr. Gary C. Pavlis, Ph.D.**  
**Atlantic County Agricultural Agent**

**Fertilization:** Fertilizer recommendations which are based on soil analysis are nearly worthless. Leaf and soil samples which had been taken from the same plant never agreed, and the leaf analysis shows what is actually getting into the plant. So, what do we do about this? I believe the only important thing that we learn from soil analysis is pH. Yes, pH is critical. Many growers have heard me say that

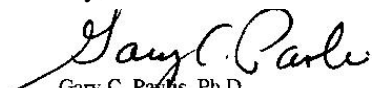


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the three most important things you must know to grow blueberries is pH, pH, and pH. This is especially true for growers who have plantings that are not on soils that are naturally 4.5 to 4.8. The pH of the soil must be known because leaf analysis results assume that the pH is within the correct range. If it is not within that range, I would not rely on the leaf analysis recommendations.

So, what should growers do about fertilizing their blueberries? First, every blueberry grower should have their blueberry soils tested for pH. If soil pH is not within the 4.5-4.8 range, this should be adjusted immediately. If the pH is higher, sulfur is added. If the pH is lower, lime is added. The amount of sulfur or lime depends on your pH and I would have the pH tested in the spring and fall until the proper range is attained. Thereafter, fall pH tests are best because adjustments can be made then and the pH will be correct by bud break in the spring. Second, this year's N-P-K application should be made at bud break. But realize that the amount, 600 lbs/Acre of 10-10-10 on a mature planting is largely a guess until we take leaf samples in July. After that we can make recommendations based upon the leaf analysis. Note: this can only happen if the soil pH is correct or we must continue to guess on the recommendations. Lastly, these changes are needed because even though the samples we took last year were from growers who are some of the best blueberry growers in the world, 70% of the plants were deficient in Nitrogen, and 97% were deficient in one of the micro-nutrients. Nutrient deficiencies cause decreased yield, lower fruit quality, increased disease problems and plant mortality. We need to make these changes as soon as possible.

Sincerely,



Gary C. Pappas, Ph.D.  
Atlantic County Agricultural Agent

**Editor - Blueberry Bulletin/GP/slp**

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## INSECTS

### Importance of Pollinators to Blueberry

#### Production

**Rachael Winfree, Ph.D., Assistant Professor,  
Department of Entomology, Rutgers  
University New Brunswick**

**Faye Benjamin, Ph.D. Candidate, Graduate  
Program in Ecology and Evolution, Rutgers  
University New Brunswick**

Highbush blueberry, like most flowering plants, requires pollination to achieve its maximum fruit production. Pollination is the transfer of pollen grains, which contain the male gametes of a plant, from the anther (male structure) to the stigma (part of the female structure) of a flower (Figure 1). The pollen then germinates (Figure 2) and fertilizes the ovules of the flower, which become the seeds. The wall of the ovary becomes the fruit. Pollination by pollinators such as honeybees is an essential step in obtaining maximum yield. However, blueberry can produce fruits without any pollination at all, and can also self-pollinate without pollinators. The rest of this article explains the relationship between pollination and fruit production in blueberry, with a focus on the value added by pollinators.

#### ***Blueberry production without pollination.***

Many varieties of highbush blueberry are at least moderately parthenocarpic, which means that even flowers that are never pollinated will still develop a small fruit with no seeds (Eck 1988). Parthenocarpic ability varies between cultivars, and more recent cultivars have increased parthenocarpy. In one study of Northland, Patriot and Bluecrop, the researcher removed the anthers from flowers (emasculatation) so that they could not self-pollinate, and also excluded pollinators so

that the flowers couldn't be cross-pollinated. These flowers set fruit only 26% of the time (Mackenzie 1997). In addition, parthenocarpic berries are smaller than pollinated ones and are less desirable. Thus even though blueberry can produce fruit without any pollination at all, production is poor.

***Blueberry production with pollination, but without pollinators.*** Since blueberry flowers have both anthers and a stigma, self-pollination within the flower by gravity or wind can occur without the assistance of bees. However, such pollination usually only occurs at low levels because the receptive stigma surface faces down (Figure 1), such that pollen falling from anthers is unlikely to stick to the stigma (Ritzinger and Lyrene 1999). The extent of fruit production that occurs due to self-pollination that is unassisted by pollinators can be tested using flowers that are excluded from pollinators. The variety Jersey had 84% fruit set on pollinator-excluded flowers in one recent study (Isaacs & Kirk 2010). However, most other varieties don't set this much fruit without pollinators (Eck 1988), and for all varieties including Jersey, berry weight is reduced without pollinators (Eck 1988, Free 1993, Mackenzie 2008, Isaacs and Kirk 2010). In summary, even for varieties that can achieve high fruit set through self-pollination in the absence of pollinators, yields are still low because berries are small.

***Blueberry production with pollinators.*** Pollinators move pollen in several different ways, all of which benefit blueberry production: from the anthers to

the stigma within a single flower (assisted self-pollination within the same flower), between flowers on the same bush, between bushes in a single-cultivar block, and between blocks of different cultivars (this last is called cross-pollination). All types of pollination provided by pollinators increase fruit set, increase fruit weight, and shorten ripening time.

*Fruit set increases with pollinators.* For most varieties fruit set increases strongly with pollination. For example, fruit set of Northland, Patriot and Bluecrop increased from 26% without pollinators to 79% with pollinators (Mackenzie 1997).

*Fruit weight increases with pollinators.* All varieties that have been studied show berry weight increases with pollinators. Here we report the main findings for the varieties that have been tested. Bluecrop, Patriot, and Northland increased berry weight by 70 – 180% when flowers were left open to pollinators, compared to pollinator-excluded controls (Mackenzie 1997). Similarly, a recent experiment with Jersey, Rubel, and Bluecrop found that berry weight increased by 100-400% for open pollinated flowers compared to pollinator-excluded controls (Tuell 2010). Even the Jersey cultivar, which achieves high fruit set without pollinators, roughly doubles in berry weight when pollinators are present (Isaacs and Kirk 2010). The reason pollination increases fruit weight is that pollination increases the number of seeds per berry (Eck 1988, Suzuki et al. 1998, Dogterom et al. 2000, Ratti et al. 2008). The developing seeds then secrete growth hormones that make the fruit larger (Mackenzie 1997). However the cultivars that are less dependent on pollination,

such as Duke, can produce large fruits even when they set few seeds (Ehlenfeldt and Martin 2010).

*Cross-pollination requires pollinators.* The only way to achieve pollen movement between varieties, or cross-pollination, is to use pollinators. Cross-pollination generally does not increase fruit set but it can increase fruit weight. Some varieties, such as Northland and Patriot, have 18-85% heavier berries with cross-pollination as compared with pollination by the same variety (Mackenzie 1997). In Bluecrop, berry weight can increase by as much as 25% when cross-pollinated with some cultivars (Ehlenfeldt 2001). In contrast Duke has similar fruit weight and set with self and outcross pollen (Ehlenfeldt 2001).

#### **How much pollen does blueberry need?**

It is difficult to measure exactly how much pollen a blueberry needs, because this requires counting microscopic pollen grains prior to applying them to the stigma. The only study to do this found that just 10 grains of pollen applied by hand was sufficient to stimulate maximum fruit set in Bluecrop (Dogterom 2000). However, achieving maximum fruit weight required at least 125 grains of pollen. Based on our own research, we can translate 125 pollen grains into the number of bee visits required to fully pollinate one flower: roughly ten honeybee visits, or four bumblebee visits (R. Winfree & F. Benjamin, unpublished data). In our next article in the Blueberry Bulletin, we will report results of our studies of blueberry pollination in and around Hammonton, New Jersey, including our estimates of whether commercial blueberry fields in this region

are receiving sufficient pollination.

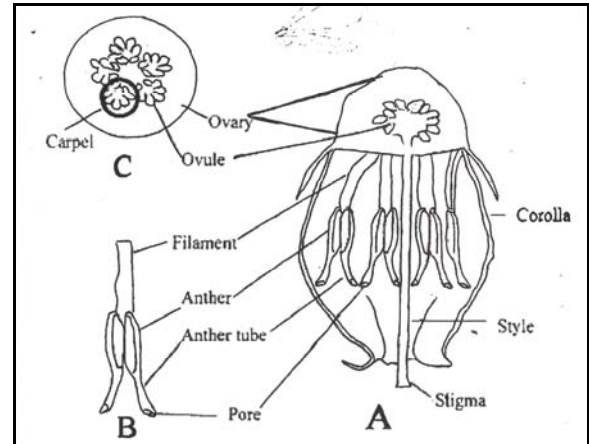


Figure 1. (A) A blueberry flower, showing (B) the anther, which holds the pollen, and (C) the ovary, which develops into the fruit.

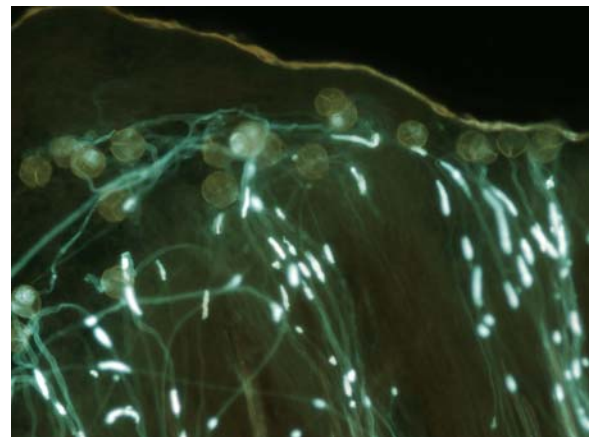


Figure 2. We took this photograph of a pollinated blueberry flower at 100X magnification through a compound microscope. It shows blueberry pollen tetrads (orange) with pollen tubes (blue-green) on the surface of a stigma. The bright spots are callose plugs in the developing pollen tubes. The pollen nuclei will travel through the pollen tubes to the ovary.

#### **References**

Dogterom, MH, ML Winston, and A Mukai. "Effect of Pollen Load Size and Source (Self, Outcross) on Seed and Fruit Production in Highbush Blueberry Cv. 'Bluecrop' (*Vaccinium Corymbosum*);

Ericaceae)." American Journal of Botany 87.11 (2000) : 1584–1591.

Ehlenfeldt, MK. "Self- and Cross-Fertility in Recently Released Highbush Blueberry Cultivars." HortScience 36.1 (2001): 133–135.

Ehlenfeldt, MK. "Investigations of Metaxenia in Northern Highbush Blueberry (*Vaccinium Corymbosum* L.) Cultivars." Journal American Pomological Society 57.1 (2003): 26–31.

Ehlenfeldt, MK, and RB Martin. "Seed Set, Berry Weight, and Yield Interactions in the Highbush Blueberry Cultivars (*Vaccinium Corymbosum* L.) 'Bluecrop' and 'Duke'." Journal of the American Pomological Society 64.3 (2010) : 162–172.

Free, John B. Insect Pollination of Crops. London: Academic Press, Harcourt Brace Jovanovich, Publishers, 1993

Isaacs, R, and AK Kirk. 2010. "Pollination Services Provided to Small and Large Highbush Blueberry Fields by Wild and Managed Bees." Journal of Applied Ecology 47 (4): 841–849.

Lang, G. & Danka, R. (1991) Honey-Bee-Mediated Cross-Pollination Versus Self-Pollination of Sharpblue Blueberry Increases Fruit Size and Hastens Ripening. Journal of the American Society for Horticultural Science, 116, 770–773.

Mackenzie, KE. "Pollination Requirements of Three Highbush Blueberry (*Vaccinium Corymbosum* L.) Cultivars." American

Society for Horticultural Science (USA) 122.6 (1997) : 891–896.

Mackenzie, KE. "Pollination Practices and the Use of Bees in *Vaccinium* Crops." IX International *Vaccinium* Symposium 810 810 (2008): 527–538.

Ratti, CM, et al. "Bumble Bees Influence Berry Size in Commercial *Vaccinium* Spp. Cultivation in British Columbia." Canadian Entomologist 140.3 (2008): 348–363.

Ritzinger, R. & Lyrene, P.M. (1999) Flower morphology in blueberry species and hybrids. HortScience, 34, 130–131.

Suzuki, A, T Shimizu, and K Aoba. "Effects of Leaf/Fruit Ratio and Pollen Density on Highbush Blueberry

[*Vaccinium Corymbosum*] Fruit Quality and Maturation." Journal of the Japanese Society for Horticultural Science 67.5 (1998): 739–743.

Tuell, JK, and R Isaacs. "Weather During Bloom Affects Pollination and Yield of Highbush Blueberry." Journal of Economic Entomology 103.3 (2010): 557–562.

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***Dr. Cesar Rodriguez-Saona, Extension Specialist in Blueberry Entomology, Rutgers University***  
***Mr. Dean Polk, IPM Agent – Fruit***  
***Mr. Gene Rizio, IPM Program Associate – Fruit***

**Cranberry Weevil (CBW):** Temperatures have been cooler over the last week, and flowers are slightly advanced. Weevil activity is lower with 25% of our samples positive for weevil activity, and just under 1% of the samples over treatment threshold. Much of the decrease is likely due to the significant treatments going on over the past 10 days.

**Plum Curculio (PC):** We saw a slight increase in PC activity this past week, but only 2 PC adults were picked up in sampling.

**Lepidoptera or worm larvae:** Only 1 spanworm has been seen in all of the beating tray sampling for the week. This is under 1% positive samples. No other lep. larvae were seen in sampling. Red-banded leafroller adults have started to fly. See trap counts below.

(See 'DISEASE' article on next page)

Diseases:

By Peter V. Oudemans, Ph.D.

Associate Professor and Extension Specialist

Plant Pathology

For **anthracnose** management, the most critical period to begin is at early to midbloom. Initiating applications at this time have been demonstrated to be most effective. Choice of materials should be determined by efficacy. Our research has shown that Abound applied during bloom will reduce migration of the pathogen from its overwintering reservoir to the developing fruit. Other fungicides are effective at protecting the developing fruit. For susceptible cultivars such as Bluecrop apply Abound twice during bloom and once with Ziram, Captan or Omega. Subsequent fungicide applications should utilize protectant fungicides such as Abound, Captan, Omega or Ziram. It is my experience that Ziram provides a longer residual period and a 14-day interval is reasonable. Captan will require a 7-day interval. Fungicides such as Pristine or Switch are effective for protecting against Mummy, Botrytis and Anthracnose while Captevate can be used for Botrytis and Anthracnose.

**THE TARGET:** Blueberry flowers like the one in this photo are expanded and the target for sprays is nicely exposed. Applications made to early will result in missing the target.

The target we are aiming for is the exposed flower stem (pedicel) and the green base (calyx) of the flower



Abound, Cabrio, Pristine Resistance!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

Fungicides are subject to resistance if they are over used or improperly used. Some fungicides are considered high risk since a relatively simple genetic mutation in the fungus can lead to resistance. Other fungicides are considered low risk since it would require complex genetic changes for resistance to develop. The best strategy to reduce the chance of resistance is to use effective low-risk fungicides between applications of high-risk fungicides. In blueberry we have two fungicides that are considered high risk. These fungicides are related and this means resistance to one results in resistance to the other. It is critical therefore to never use these fungicides more than twice in a row and preferably only once. Abound and Pristine both contain a strobilurin fungicide as the active ingredient. Therefore these materials should not be used in succession in a spray program. The Table below gives some examples of spray regimes that may or may not select for resistance.

Spray 1	Spray 2	Spray 3	Spray 4	Assessment
Abound	Pristine	Abound	Pristine	☹☹ <b>Very bad</b> all high risk with the same mode of action
Abound	Pristine	Ziram	Abound	☹Still heavy emphasis on high risk materials
Abound or Pristine	Ziram	Abound or Pristine	Ziram	☺ <b>Best</b> , high risk materials separated by low-risk

## USDA Warns of Fraudulent Letters

Lynne Richmond, USDA

USDA officials learned late afternoon, March 16<sup>th</sup>, that fraudulent letters are being sent by FAX to individuals and businesses in at least four states. The letters purportedly come from a USDA procurement officer and seek personal information. These letters are false and in no case should a recipient respond with personal and financial information. The fraudulent letters bear USDA's logo and seal and are signed by an individual identified as "Frank Rutenberg" using a title of "Senior Procurement Officer". Letters have been received by FAX in Alabama, Nebraska, Pennsylvania and Wisconsin, but may have also been sent to other states. Recipients should not respond and should not supply the requested information. USDA is investigating this matter through the Office of the Inspector General.

*If you suspect you have received such a letter or have questions please contact USDA at: [procurement.policy@dm.usda.gov](mailto:procurement.policy@dm.usda.gov) or call 202-720-9448.*

## Backpack Sprayer Videos Web Resources for Small Farms and Ag Educators

Jack Rabin, Assoc. Dir. - Farm Programs, Rutgers NJ Ag Expt. Station - Cooperative Extension

Check out these 7 short videos with companion handouts instructing how to better utilize modified backpack sprayers, save time and money, as well as improve safety at the following website:

<http://snyderfarm.rutgers.edu/snyder-backpack-sprayers.html>

Modified backpack sprayers offer versatile features including: simple design, inexpensive price, professional nozzle technology accuracy, and easy, safe filling/cleaning.

**These features make them an efficient, ideal choice for small, organic, or urban farms; small jobs on larger farms; and for short season crops, spot problems, work around field impediments (fences, slopes), and work inside high tunnels and greenhouses.**

Rutgers NJAES Snyder Research Farm Director John Grande has tested and shares methods to modify back-pack sprayers increasing their accuracy, improving ease of use, and for successfully applying organic products. For ag educators, a PowerPoint and speaker notes are provided. The videos are captioned; therefore may also find use in in-ternational ag development work.

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## SOUTHERN NEW JERSEY

### 2012 Plastic Pesticide Container Collection Schedule

(It's FREE and one core credit will be issued to participants with a NJDEP Pesticide license)

### Atlantic County

**LOCATION:** Helena Chemical  
66 Route 206 (North of the Route 30/206 intersection)  
Hammonton, New Jersey

**TIME:** 9:00 a.m. to 3:00 p.m.

**DATES:** Thursday, April 5 (continued on following page)

Friday, May 4  
Friday, June 1  
Friday, July 6  
Friday, August 3  
Thursday, September 13  
Friday, October 5

**Cumberland County**

**LOCATION:** Cumberland County Solid Waste Complex  
169 Jesse Bridge Road (located off Route 55, Exit 29)  
Deerfield, New Jersey  
(Open trucks or trailers must be tarped before entering Complex)

**TIME:** 9:00 a.m. to 12 Noon

**DATES:** Friday, May 18  
Friday, June 15  
Friday, July 20  
Friday, August 17  
Friday, September 21  
Friday, October 19  
Friday, November 16

**Salem County**

**LOCATION:** Helena Chemical  
440 N. Main St.  
Woodstown, New Jersey

**TIME:** 9:00 a.m. to 3:00 p.m.

**DATES:** Friday, April 13  
Friday, May 11  
Friday, June 8  
Thursday July 19  
Friday, August 10  
Thursday, September 14  
Friday, October 12

This program is offered to agricultural, professional and commercial pesticide applicators who hold a NJDEP pesticide license. State, county and municipal government agencies may also participate. A representative from the New Jersey Department of Agriculture will be on-site to inspect the containers and issue one core credit to pesticide license holders who follow all of the required processing steps. To receive credit, participants must bring their pesticide license to the collection site and must follow all of the processing steps. Core credits will not be issued to participants who fail to follow all of the pesticide container processing steps.



### ***Plastic Pesticide Container Processing Steps & Size Limits:***

1. All pesticide containers must be either triple rinsed or pressure rinsed, drained and dry inside;
2. All pesticide containers must be free of residue (other than stains);
3. The booklet must be removed (it is not necessary to remove the paper labels glued to the container);
4. Foil seal must be removed;
5. Only non-refillable pesticide containers will be accepted – you must drill a ¼-inch hole in the bottom of the container or with a utility knife make a 6-inch slit in the bottom of the container so the container will not hold liquids;
6. Only pesticide containers embossed with HDPE or the recycling #2 will be accepted;
7. Pesticide containers up to 55-gallons in capacity will be accepted. 5-gallon pails must be cut in half; 30-gallon containers into at least 4 pieces; and 55-gallon containers into at least 8 pieces. This can be accomplished using a sawzall, chainsaw, circular saw, or reciprocating saw. It is not necessary to cut up containers less than 5-gallons; and
8. Pesticide containers must have originally held an EPA registered pesticide.

### ***Items That Will Not Be Accepted and Will be Returned to the Recipient:***

1. Pesticide containers with dried formulation on the container, pour spout or the spout threads;
2. Pesticide containers with any liquid residue;
3. Pesticide containers where the insides are caked with dried residue;
4. Mini-bulk, saddle tanks and nurse tanks, which can be made of fiberglass;
5. Pesticide containers with lids; or
6. Containers that held any type of petroleum oil product or antifreeze.

### ***Non-Waxy Cardboard Collection***

Atlantic and Salem County collection sites: Helena Chemical will also be accepting, at no charge, non-waxy cardboard from their customers since their products are sold to the end user in cardboard boxes. Every Friday during the months of April through October 2008 from 1p.m. to 3 p.m and during the scheduled pesticide container collection times, cardboard will be accepted. Clean non-waxy cardboard must be broken down and flattened. The flattened cardboard must be tied for the Atlantic County collection site. Tying is not required at the Salem County collection site. Clean Non-waxy cardboard will also be accepted year-round at the Cumberland County Solid Waste Complex's Convenience Center.

### ***Other Rigid Plastic Recycling***

If you generate other clean non-petroleum containing HDPE plastic (crates, buckets, pails, etc.), the Cumberland County collection site may accept the material. Contact Karen Kritz, Recycling Manager, NJDA, 609-984-2506, or Dennis DeMatte, Cumberland County Recycling Coordinator, at 856-825-3700 to see if the plastic can be recycled. If you have large plastic containers that you cannot cut up, contact Karen Kritz to see if accommodations can be made to accept them at one of the sites.



DR. GARY C. PAVLIS  
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## ***BLUEBERRY BULLETIN***

If you have any comments about this newsletter, please make them in the space below and mail to:

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6260 Old Harding Highway, Mays Landing, NJ 08330

I would like to see an article on the following subjects: \_\_\_\_\_

I would like to comment on the following articles: \_\_\_\_\_

Title: \_\_\_\_\_ Date: \_\_\_\_\_

Comment: \_\_\_\_\_

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