The tobacco aphid, *Myzus nicotianae*, is the most important insect pest on tobacco in Virginia. There are red and green forms of the tobacco aphid. In 1986, the red form first occurred on tobacco in Virginia and within a year it had almost completely replaced the previously common green form as the most serious insect pest on tobacco. The red form is more tolerant of high temperatures and more resistant to several insecticides than the green form. A major concern in the management of this pest is its potential for developing resistance to the few remaining insecticides that still provide effective control. In other regions of the world, the red form has developed resistance to Orthene, which is the most widely used and effective foliar insecticide for control of the tobacco aphid in Virginia. So far there have been some problems with controlling the tobacco aphid in Virginia, but widespread resistance has not been observed. Treating early for aphid control and rotations of foliar insecticide treatments are being emphasized to reduce annual problems with this pest. During most years, at least one foliar insecticide application is required for tobacco aphid control. In the past, some growers have waited too long before applying an insecticide for control of the tobacco aphid. Insecticide applications often failed to control the resulting high aphid populations, and more insecticide applications were applied than were needed. Other growers have treated on a schedule, using much more insecticide than was necessary.

Other important tobacco insect pests include hornworms, tobacco budworms, tobacco flea beetles, and wireworms. Hornworms and budworms can be managed to a certain extent through effective cultural practices and the promotion of several parasitoids that help to maintain pest populations at low levels. Several foliar insecticides provide effective control of hornworms and budworms. A high percentage of the flue-cured tobacco growers use soil insecticides to control wireworms and cutworms. More information is needed to determine the potential importance of wireworms in the absence of preventive treatments for their control.

Program goals and objectives: The research and extension entomology programs on tobacco deal with the management of insect pests on the four types of tobacco, *Nicotiana tabacum*, grown in Virginia. The research objectives are to: 1) quantify insect damage to tobacco, 2) determine the host range and life history of the tobacco aphid, *Myzus nicotianae* Blackman, 3) investigate the influence of resistant cultivars, cultural and natural controls on tobacco insect pests, and 4) determine the effects of insecticides and pesticide application methods on beneficial and pest insects on tobacco. The tobacco entomology extension program encourages tobacco producers to adopt integrated pest management practices. These practices include the optimum use of cultural, and natural controls, and the application of foliar insecticides only when field scouting indicates that treatment is needed to increase crop production efficiency.

Extension

Although there are no formal scouting programs on tobacco in Virginia, a large proportion of the flue-cured tobacco growers (about 75% of the acreage) either scout the fields themselves or assign that responsibility to employees. An estimated 80% of the flue-cured tobacco acreage is scouted for insects and other pests on a regular basis. During the past three years, growers have generally treated at the threshold for control of the tobacco aphid. This has resulted in improved control and decreased requirements for multiple insecticide applications to bring aphid populations under control later in the season. Scouting has resulted in improved timing of foliar insecticide applications. Growers save about one insecti-
icide application per year valued at $10.00/acre ($500,000 a year state wide) and crop value has increased an average of $25-30/acre/year ($1.25-1.5 million) over the past 3 years as a result of pest scouting, treatment at the threshold and improved cultural practices.

The extension program in tobacco entomology has two main components, one is informational and the other is developmental. In the first component, tobacco producers are provided with information on tobacco pest management through publications (including the Flue-Cured and the Dark Fire-Cured Tobacco Production Guides), area and county grower meetings, field days, farm tours and through contact with extension agents. The developmental objective deals with helping the farmer to produce his crop more efficiently, while reducing pesticide use and improving environmental quality. Most growers are now familiar with the use of economic thresholds, proper methods and timing of pesticide applications. They are also knowledgeable of the importance of cultural controls and beneficial organisms for managing tobacco insect pests.

Research

Use of treatment thresholds for timing foliar insecticide applications for tobacco aphid control. Research was conducted to determine the benefits of using thresholds to time insecticide applications for aphid control. Two applications of Orthene at the recommended threshold (20% of plants with 50 or more aphids/4 upper leaves) for aphids gave aphid control, yields, and returns similar to those obtained with 3 to 4 applications of Orthene made on 2-week schedules, and a preventive treatment with Temik applied before transplanting. Research on the benefits of aphid control after topping showed that just one insecticide application for aphid control before topping reduces the chance that aphids will build up on tobacco after topping. However, if control was delayed until after topping, insecticide applications at that time prevented yield losses of 6-7% under moderate aphid pressure in 1992 and yield losses up to 23% under very high aphid pressure in 1991. The damaging aphid populations after topping occurred within 21 days after topping. These findings support the use of a pest scouting programs to monitor insect pests on tobacco.

Influence of pretransplant herbicides, fungicide, and nematicide use on tobacco aphid populations. The first year of this 3-year study indicated that the use of pretransplant applications of the herbicide, Tillam, and the fungicide, Ridomil, may be related to higher incidence of aphids on tobacco after topping. However, tobacco treated with these chemicals had aphid populations similar to untreated tobacco during 1991 and 1992. There were no significant differences among the plots treated with Ridomil, Tillam, and the untreated control. These findings indicate that in some cases the use of certain pretransplant chemicals applied to the soil is related to increases in aphid infestations before and after topping. The responses to soil treatments were not consistent from one year to the next.

Insect resistance in various tobacco types, cultivars and breeding lines. Tobacco aphid populations were compared on 23 different tobaccos in one test and 18 different tobaccos in a second test. In one test, two breeding lines from South Carolina provided excellent aphid control, had higher prices and over 30% higher yields than two standard flue-cured tobacco cultivars (‘K-326’ and ‘Coker 319’) when both were exposed to high aphid infestation pressure. The dark fire-cured tobacco line, ‘Virginia 309’, had much lower aphid infestations than the other commercial cultivars tested. The development of host plant resistance to aphids and budworms should greatly reduce the amount of insecticide used on tobacco.

Potential new chemicals for tobacco insect control. Several promising experimental pesticides were evaluated for control of the tobacco aphid, the tobacco flea beetle, and the
tobacco budworm. These chemicals were much
less harmful to the environment and more host
specific than most of the chemicals that they
would replace. NTN 33893 (Confidor) had excel-

tent activity against the tobacco aphid and the
tobacco flea beetle when applied in the transplant
water on flue-cured, dark fire-cured, and burley
tobaccos. Foliar applications of less than 0.1 lb
(AI)/acre of NTN 33893 provided aphid control
similar to the 0.75 lb (AI)/acre rate of Orthene
applied as a foliar spray. RH-7988 continued to
provide excellent control of the tobacco aphid on
flue-cured and burley tobaccos. M-Peril bait (con-
taining a Bacillus thuringiensis toxin encapsu-
lated in another bacteria on corn grit) gave good
control of the tobacco budworm, but it was not as
effective as the standard B. thuringiensis bait
(Dipel 10G). The insecticidal soap, M-Pede, was
not effective against the tobacco aphid when ap-
plicated alone. However, a combination of M-Pede
and a one-half rate of Orthene provided the same
control of the tobacco aphid as the full rate of
Orthene alone.

Seasonal occurrence of pathogens of the
tobacco aphid. Preliminary studies were con-
ducted to determine the seasonal occurrence of
Pandora neoaphidis, a fungal pathogen, in the
tobacco aphid on various types of tobacco. On
flue-cured tobacco approximately 2-5% of the
aphids were killed by the fungus on 8 and 17 July.
After a hot, dry period, no diseased aphids were
found on 21 July. But the disease incidence began
to increase during a wet period between 24 July
and 7 August. Over 30% of the aphids in one field
were killed by the fungus, while maximums in two
other fields were in the 15-20% range. The
incidence of aphids killed by fungus declined to
less than 5% by 19 August. The numbers of aphids
killed by the fungus were rated on 23 different
tobaccocultivars, types, and breeding lines. Mum-
mies of diseased aphids were most common on
‘K-326’ and the non-flowering tobacco cultivar,
‘NC 37 NF’. Low disease levels were found on
‘K-399’, ‘Coker 319’, and ‘Hicks’.

Comparison of the tobacco aphid and the
green peach aphid on different host plants. The
red and green morphs of the tobacco aphid lived
longest and produced the most nymphs on tobacco
in laboratory studies. The green peach aphid lived
for a shorter period of time and produced about
one-fourth as many nymphs as the tobacco aphids.
Under laboratory conditions the red and green
morphs of the tobacco aphid and the green peach
aphid did well on Solanum nigrum, S. carolinse,
potato, turnip, and pepper. Poor hosts of both
aphid species included: garden beans, strawber-
ries, iris, peach, and tomato. The green peach
aphid adapted well to tobacco after continuous
rearing on that host for 10-15 generations.

Future plans
The tobacco entomology extension program
will continue to emphasize the use of cultural and
natural controls, and insecticide treatments when
field scouting and treatment thresholds indicate
that insecticide application is needed to prevent
economic damage. Research in tobacco entomol-
yogy will continue on the timing of insecticide
applications for optimum insect control, the use of
cultural practices to reduce insect problems, aphid
pathogens, and the evaluation of various cultivars
for resistance to the tobacco aphid. The incidence
of wireworms in tobacco fields in relation to field
history will also be studied.