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Diphenamid at the rate of 4 lbs. to the acre was applied over transplants of Broadleaf tobacco (left). No treatment was applied to the area on the right.

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The need for weed control in tobacco (*Nicotiana tabacum* L.) has long been recognized. Weeds compete with tobacco for light, nutrients, and water and, if allowed to remain, interfere with harvest. Weeds also harbor insects and in the case of horsenettle (*Solanum carolinense* L.) serve as an alternate host for tobacco mosaic virus. Moderate stands of weeds growing in cultivated but unhoed Connecticut tobacco can reduce yields by 25 per cent (1). Yield reductions from weed competition are related to density of the weed population. Cultivation aids in the control of weeds but continued close cultivation also can reduce yields (1).

For generations hand hoeing has been the standard method of controlling weeds in tobacco. Two, and sometimes three, hoeings usually are required to satisfactorily control weeds. As the cost of hand labor increases and its availability decreases, other more efficient methods of weed control must be considered.

The use of chemical weedkillers in Connecticut tobacco has been under investigation since 1958. We sought to find herbicides that would effectively control weeds and thus reduce the need for hand hoeing without adversely affecting the growth, yield, or quality of Connecticut Broadleaf and Shade Grown tobaccos. In our early tests Shade Grown tobacco was especially sensitive to herbicide injury (1). Of the 20 herbicides tested during the years 1958 to 1962, only a few were deemed safe enough for continued evaluation. The work reported here represents our efforts from 1963 to 1967.

This publication reports the results of experiments on herbicides in tobacco, the purpose of which was to determine their effects on weeds, their effects on tobacco, and their residual effects on cover crops that are sown in the fall. All materials not at present approved (labelled) for use on tobacco are discussed in this report for information of the reader only. Only those materials specifically labelled for tobacco should be used for the commercial production of tobacco.

METHODS

Herbicide trials were conducted at the Valley Laboratory of The Connecticut Agricultural Experiment Station and on tobacco farms in cooperation with growers. All cultural practices in the growing of the tobacco were normal for Broadleaf or Shade Grown tobacco. The herbicides were applied either before or after planting, as granules or as sprays in 50 gallons of solution per acre. Treatments applied before planting were mixed into the soil, either by chopping in with a rake, by disking, or with a spring-tooth harrow. Treatments after planting were applied directly over the tobacco. In one trial in the beds, herbicides were applied directly after seeding tobacco. The treatments were replicated two to four times in each trial.

In all tests, zones between the rows were cultivated as in normal practice. Observations were made of visual injury to the tobacco and the percentage control of weeds. In some trials, to determine residual effects of the herbicides, evaluations were made of injury to crops seeded after the tobacco was harvested.

The tobacco from the herbicide plots was harvested and cured by standard methods. In the case of Broadleaf, all of the tobacco from the plots except border plants was harvested and evaluated, but in the case of Shade tobacco, 200 to 500 leaf samples from the second and fourth primings were harvested and cured from each plot.

Yield of tobacco was obtained by weighing the cured leaf. The relative value of the tobacco or grade index, a measure of leaf quality, was obtained by sorting the tobacco by standard Broadleaf and Shade tobacco grades. In some tests the fire-holding capacity or burn of the cured tobacco was determined by igniting spots in the tips, middles, and bases of composite leaf samples. Cigars were wrapped with tobacco from the 1965 Shade experiment and distributed to 18 different smokers. The smokers were asked to evaluate each pair of the coded cigars (wrapper from hand-hoed tobacco vs. wrapper from tobacco treated with diphenamid) by stating their preference, if any.

RESULTS

The results obtained with each herbicide in the various experiments conducted from 1963 to 1967 are discussed below. Dosages of the herbicides used are given in terms of pounds of active ingredient per acre (lb/A). The following symbols are used in the tables to describe formulations of herbicides: wp. = wettable powder, ec. = emulsifiable concentrate, G. = granular.

Diphenamid (N,N-dimethyl-2,2-diphenylacetamide, available as Dymid or Enide) has been in our tests for the control of weeds in tobacco since 1960. As a result of extensive testing throughout tobacco growing areas, granular and wettable powder forms of Enide are currently registered for weed control in tobacco fields and seedbeds. Enide and Dymid are also commonly used in certain vegetable crops and ornamental nurseries.

Diphenamid has proved to be excellent for the control of annual grasses, lambsquarters (*Chenopodium album* L.), purslane (*Portulaca oleracea* L.), pigweed (*Amaranthus* spp.), and several other annual weeds commonly occurring in tobacco. It fails to control a number of broadleafed annual and perennial weeds. In our trials control has varied from poor to excellent, depending primarily on the weed species and to some extent on adequate moisture following application (1) (Tables 2, 5 and 6). Diphenamid did not control ragweed (*Ambrosia artemisifolia* L.) or galinsoga (*Galinsoga spp.*) and the perennial horsenettle (*Solanum carolinense* L.) when present in our plots. Applications on emerging weed seedlings, followed by dry weather, have resulted in poor control of susceptible weeds. Working the soil just before or after applying diphenamid has given good results. Diphenamid inhibits root growth in weed seedlings. Even weeds not killed often have poor root systems.

Diphenamid was also tested by us for use around the tents of Shade Grown tobacco. In 1963 trials, at rates of 5 to 6 lb/A in early June, diphenamid gave good seasonal control of annual grasses and susceptible broadleafed weeds in these locations. Since many resistant weeds often invade the edges of shade tents, control can be expected to vary greatly from one location to another.

Although diphenamid has limited value for control of weeds already established around shade tents, we found combinations of diphenamid with the contact herbicide, *paraquat*, (1,1′-dimethyl-4,4′-bipyridinium cation, available as Ortho Paraquat) at 1 lb/A, very effective in killing established weeds and preventing further infestation. Paraquat is quickly inactivated in soil and leaves no residues in the soil that can injure tobacco in the tents. This was demonstrated by treating seedbeds with paraquat, sampling the soil one week later, and then mixing the soil and reseeding to tobacco. Germination and growth of tobacco in the treated soil were unaffected. No injury to tobacco from tent-edge treatments was ever noted with diphenamid or with mixtures of diphenamid and paraquat. However, in applying paraquat around the edge of shade tents, spray drift onto tobacco in the tents must be avoided.

The activity of diphenamid often is improved when it is worked into the soil. While the 4 lb/A rate of diphenamid is considered normal for the lighter soils in which tobacco is grown, a lower rate of 3 lb/A was adequate in 1966 and 1967 when the diphenamid was harrowed into the soil ahead of planting (Table 6).

The effects of diphenamid on growth, yield, and quality of tobacco are given in Tables 1, 3, 4, 5 and 6. Newly seeded and field grown tobacco appear to be very tolerant of diphenamid. Applied just after seeding in tobacco beds, diphenamid (Enide) granules at 3 or 6 lb/A of active ingredient caused no visual injury to AST 2238 (Table 5). In the Connecticut River Valley tobacco often occurs as a weed in ornamental nurseries treated with diphenamid.

We have never observed injury to tobacco from normal rates of diphenamid applied after transplanting. In 1963, when applied after planting at two and three times the normal rate, diphenamid reduced the early growth of Broadleaf without significantly affecting yield, grade index, or burn (Table 1). In 1965, applications of diphenamid after planting in Broadleaf and in Shade Grown tobacco had no significant effect on yield or grade index. However, in the Shade experiment of that year the burn of tobacco treated with diphenamid was significantly greater than that of the hand-hoed tobacco (Table 4). Leaf strength was not affected by diphenamid.

Cigars were wrapped with diphenamid treated and hand-hoed tobacco from the 1965 trial, using uniform binder and filler tobaccos. Of the 70 pairs of cigars evaluated by 18 different smokers, cigars with the diphenamid wrappers were preferred in 28 comparisons, cigars with the hand-hoed wrapper were preferred in 19 comparisons, and in 23 comparisons the smokers could distinguish no difference between the two. Obviously, diphenamid did not adversely affect the smoking quality of the 1965 wrapper tobacco.

Applications of diphenamid before planting were investigated in 1963 in Broadleaf and in 1965, 1966, and 1967 in Shade tobacco (Tables 1 and 6). In tests where the herbicide was lightly worked into the soil with a rake before planting, diphenamid reduced the early growth of Broadleaf and Shade. At the normal rate of application these effects were short term and did not affect yield or quality. In the 1967 trial in Shade tobacco (Table 6), where treatments were worked into the soil with a springtooth harrow the day before planting, diphenamid did not affect early growth, leaf weight, leaf size, or grade index of the second or fourth primings.

While not injurious to tobacco, diphenamid does persist in the soil and can injure cover crops that follow tobacco. Diphenamid at 4 lb/A or more often prevents growth of oats or rye in the fall (Table 2), but these effects are influenced by seasonal and cultural practices. If the soil is only disked as in 1963 (Table 2), oats sown the following year are affected, but sweet corn is not, except when diphenamid is used at very high rates. Experience has shown that plowing greatly dilutes diphenamid and lessens the chances of injury to sensitive crops the following year. In 1967, the application of diphenamid before planting Shade tobacco did not affect the growth of rye seeded in early October.

Table 1. Effect of preplanting and postplanting herbicides on Broadleaf tobacco in 1963[1]

Herbicide	Rate active ingredient lb/A	Visual injury to tobacco	Yield lb/A	Grade index dollars/lb
Treatments applied before planting and chopped into soil with a rake				
diphenamid, wp.	4	slight	1916	.700
	8	moderate	1814	.690
trifluralin, ec.	1	severe	1530	.595
	2	severe	1271	.584
Treatments applied after planting				
diphenamid	4	none	1950	.694
	8	very slight	1920	.693
	12	very slight	1881	.706
trifluralin, ec.	1	slight	1949	.712
	2	moderate	1718	.653
vernolate, G.	3	slight	1902	.678
	4½	slight	1900	.655
DCPA, wp.	8	severe	1122	.520
	10	severe	978	.393
hoed check		none	2036	.724
weedy check		none	1896	.721
Least significant difference p = .05			235	.061

[1] Preplant treatments applied June 3. Tobacco planted June 3. All plots cultivated June 6 and twice thereafter. Plots were single rows 32′ long, replicated 4 times. Restocking was done on June 10.

Table 2. Effects of preplanting and postplanting herbicides on the control of weeds and on crops following Broadleaf tobacco[1]

Herbicide	Rate active ingredient lb/A	Percentage control weeds in tobacco		Percentage stand of oat cover crop	Percentage stand of oats	Height of sweet corn inches
		7/17/63	9/14/63	10/23/63	6/18/64	7/8/64
Treatments applied before planting and chopped into soil with a rake						
diphenamid, wp.	4	96	95	5	50	51
	8	99	100	4	13	45
trifluralin, ec.	1	94	77	49	90	49
	2	96	89	8	38	38
Treatments applied after planting						
diphenamid, wp.	4	95	95	4	48	50
	8	100	100	4	5	52
	12	100	100	2	3	41
trifluralin, ec.	1	93	79	69	95	48
	2	94	94	15	73	45
vernolate, G.	3	99	91	90	90	49
	4½	96	97	84	95	52
DCPA, wp.	8	89	77	29	95	45
	10	90	82	13	95	45
hoed check		60	92	92	95	51
weedy check		0	0	91	95	50

[1] See Table 1 for details of treatment. Soil disked in fall of 1963 and spring of 1964 and planted to crops indicated. Major weeds were crabgrass (*Digitaria* spp.), pigweed (*Amaranthus* spp.), lambsquarters (*Chenopdium album*), and carpetweed (*Mollugo verticillata*).

Despite these effects on cover crops, diphenamid appears to be the best herbicide currently available for use on Connecticut tobaccos.

Trifluralin (α,α,α-trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine, available as Treflan) has been tested for several seasons in Connecticut Broadleaf and Shade tobacco. Treflan is available in granular and liquid emulsifiable concentrate forms for use in certain food and ornamental crops but it is not currently labelled for use in tobacco.

Trifluralin controls about the same weed spectrum as diphenamid. It has been very effective against annual grasses, carpetweed (*Mollugo verticillata* L.), pigweed, and lambsquarters, but has not controlled ragweed or horsenettle. It is lost on the soil surface by evaporation and requires soil incorporation for consistent weed control. In our sandy tobacco soils, ½ to ¾ lb/A of active trifluralin is sufficient for seasonal control of susceptible weeds.

Table 3. Effects of herbicides applied 2 weeks after planting on Broadleaf tobacco in 1965[1]

Herbicides and formulation	Rate lb/A	Visual injury	Yield lb/A	Grade index dollars/lb
trifluralin, ec. (Treflan)	.75	slight	1930	.788
	1.5	moderate	1472	.680
benefin, ec. (Balan)	.75	slight	1820	.763
	1.5	moderate	1667	.737
diphenamid, wp. (Dymid)	4	0	2076	.754
weedy check		0	2018	.776
Least significant difference p = .01			210	.034

[1] Tobacco planted June 6, 1965. Herbicides sprayed over tobacco June 18. All treatments were lightly incorporated with a rake and row middles were cultivated June 18. Weeds were sparse in this test.

Applied over Broadleaf or Shade tobacco plants, trifluralin sprays have consistently caused injury (Tables 1 & 3). Lower leaves are distorted and early growth is reduced. However, on Broadleaf at 1 lb/A in 1963 (Table 1) and at ¾ lb/A in 1965 (Table 3) this injury was slight and did not significantly affect yield or grade index of cured leaf.

The tolerance of tobacco to trifluralin applied before planting has varied in our tests. Incorporated into the soil to a shallow depth by means of a rake in 1965, trifluralin severely injured Broadleaf at 1 lb/A (Table 1) and slightly injured Shade at ¾ lb/A. With deeper mixing into soil by means of a disk or springtooth harrow in 1966 and 1967, trifluralin caused no injury at 1 lb/A or less (Table 6).

At effective rates for weed control, trifluralin is less persistent than diphenamid and causes less injury to cover crops seeded in the fall or the following spring (Table 2). In the 1967 trial in Shade tobacco, trifluralin did not affect rye seeded in October.

Further work would be needed to determine conclusively whether trifluralin could be used in Connecticut tobacco without affecting yield or quality of leaf.

Benefin (N-butyl-N-ethyl-alpha, alpha, trifluoro-2,6-dinitro-p-toluidine, available as Balan) is chemically similar to trifluralin. It has been tested for three seasons for the control of weeds in Connecticut tobacco. In 1965 we applied it 2 days after planting Broadleaf tobacco (Table 3) and in 1966 and 1967 we applied it before planting Shade tobacco (Table 6). Benefin currently is labelled for use in Burley and flue-cured tobaccos.

Benefin controls about the same range of weeds as diphenamid and trifluralin. Like diphenamid it has not controlled ragweed or horsenettle. Control of annual grasses, carpetweed, lambsquarters, and pigweed has been excellent with Benefin at rates of ½ to 1 lb/A. To prevent loss through volatization or inactivation by ultraviolet light benefin must be incorporated into the soil.

In 1965, applications of benefin over Broadleaf tobacco caused slight to moderate distortion of lower leaves (Table 3). However, at ¾ lb/A it did not significantly affect yield or grade index.

In 1966, benefin at ½ or 1 lb/A, disked into the soil the day of planting, also caused slight reduction of early growth in Shade tobacco. Fresh weights of leaves from benefin treated plots were not less than those from the hand-hoed checks. In the 1967 trial, benefin at ½ or 1 lb/A, harrowed into the soil the day before planting Shade tobacco, caused no significant reductions of growth, size, yield, or grade index of the cured leaf.

Table 4. A large-scale comparison of hand hoeing and diphenamid in Shade Grown tobacco (GC-1) in 1965[1]

Treatment	Average leaf length inches	Average leaf weight grams	Grade index dollars/lb	Burn seconds/leaf	Leaf breaking strength lbs/sq inch
		2nd priming			
hand hoed	16.3	3.51	7.94	30.5	1.4
diphenamid 4 lb/A	16.4	3.56	7.15	36.5°	1.8
		4th priming			
hand hoed	18.5	3.69	6.53	11.0	1.4
diphenamid 4 lb/A	18.6	3.53	6.50	15.0°	1.5

[1] Tobacco was planted May 28, 1965. Diphenamid (Enide 50W) was applied May 29 over four replicated 5-bent (⅛ acre) plots. Similar sized plots were hand hoed twice. All plots were cultivated four times. Weed control was good to excellent with diphenamid except in pole rows. All weeds were pulled from plots in July. The hand hoed plots required 41 man hours per acre for hand hoeing and weed pulling. The diphenamid plots required 21 man hours per acre for weed pulling, largely because of weeds in the pole rows.

° Values significantly greater than checks at 5% probability level.

An October seeding of rye was not affected by the benefin application in 1967. Related studies indicate that benefin is less persistent than trifluralin. Like trifluralin, benefin appears promising as an herbicide to use before planting but it should be evaluated further for its potential effects on yield and quality of Connecticut tobaccos.

Nitralin ((4-methylsulfonyl)-2,6-dinitro-N,N-dipropylaniline, available as Planavin) was tested in 1966 and 1967 for application before planting Shade tobacco. It is not labelled for use in tobacco at the present time.

Nitralin is chemically similar to trifluralin and benefin and controls about the same range of weeds. Our results from 1966 and 1967 show that nitralin at ½ to ¾ lb/A was effective against annual grasses, lambsquarters, pigweed, and carpetweed (Table 6).

Table 5. Effects of diphenamid on weeds and AST 2238 tobacco in seedbeds, 1965[1]

Treatment	Rate active ingredient lb/A	Number of weed seedlings per sq ft[2] Grasses	Broadleaves	Percentage weed control	Rating of tobacco stands[3]	Rating of tobacco vigor[3]
check	–	24.3	107.0	0	6.2	8.3
diphenamid	3	0	57.7	70	9.7	8.7
(Enide granular)	6	0.2	56.3	70	9.3	8.7

[1] Diphenamid applied 5/14/65, after seeding tobacco.

[2] Grasses—stinkgrass, crabgrass. Broadleaves—pigweed, lambsquarters, purslane, miscellaneous broadleafed weeds.

[3] 0 = no stand, dead plants, 10 = excellent stand, excellent vigor.

In both tests, nitralin caused significant early stunting in Shade Grown tobacco. Fresh weights of treated leaves were not affected in 1966 and yields, leaf size, and leaf values of the second and fourth primings were not affected in 1967. Even though it has not affected the harvested leaf, nitralin appears to be more hazardous to tobacco than trifluralin, benefin, or diphenamid.

Vernolate (S-propyldipropylthiocarbamate, available as Vernam) was tested in Connecticut Broadleaf tobacco in 1962 (1) and 1963. Vernam is labelled for use in tobacco grown in Maryland, Virginia, and Kentucky and is available in granular or liquid concentrate form.

Vernolate is effective against many annual grasses and certain annual broadleafed weeds commonly found in Connecticut tobacco fields. Our results in 1963 are given in Table 1. Vernolate is also effective against the perennial nutsedge (*Cyperus esculentus* L.). It is volatile and must be incorporated with soil to prevent surface losses.

In 1962 we observed a reduction in early growth of tobacco with granular vernolate applied 2 days after planting (1). In 1963 we obtained similar results with liquid vernolate when applied at 3 or 4½ lb/A on Broadleaf 2 days after planting, but only the higher rate significantly lowered the grade index of the cured leaf. Tobacco yields from both treatments were about equal to those of the weedy controls (Table 1). Nevertheless, by reducing early vigor of Broadleaf, vernolate potentially is hazardous when applied after planting. We did not apply vernolate before planting but Klingman (4) reports good results in flue-cured tobacco.

DCPA (dimethyl-2,3,5,6-tetrachloroterephthalate, available as Dacthal), bensulfide (N-(2-mercaptoethyl) benzenesulfonamide S-(O,O-diisopropyl phosphorodithioate, available as Prefar)), and siduron (1-(2-methylcyclohexyl)-3-phenylurea, available as Tupersan) also were tested in tobacco. None of these herbicides is labelled for use in tobacco.

Sprayed over Broadleaf in 1963, DCPA severely injured the tobacco and reduced yields and the grade index (Table 1). Similar results were obtained with DCPA in earlier work in Shade Grown (1).

Bensulide and siduron were tested in Shade tobacco in a screening

Table 6. Effects of preplanting treatments on weeds and Shade tobacco (Culbro 396) in 1967[1]

Treatment	Rate lb/A	Percentage weed control	Visual injury at 6 weeks	Average leaf length inches[2]	Average leaf weight grams per leaf[2]	Grade index dollars per lb[2]
nitralin, wp.	¾	86	slight	17.1	3.03	8.22
	1½	89	slight to moderate	17.5	3.06	8.56
trifluralin, ec.	½	90	none	16.9	2.89	8.18
	1	94	none	17.9	3.16	8.37
benefin, ec.	½	85	none	17.9	3.13	8.19
	1	89	none	17.2	2.94	7.95
diphenamid, wp.	3	89	none	17.6	3.09	8.18
	4½	79	none	17.4	3.01	8.16
hoed check		0	none	16.8	3.03	7.55

[1] Treatments were applied on June 7, 1967 on four replicated 12′ × 33′ plots. The plot area was dragged with a springtooth harrow 2 hours later. The tobacco was planted on June 8. The predominant weeds were crabgrass, lambsquarters and ragweed.

[2] Values are for 2nd priming only. Data for the 4th priming showed similar results.

trial during 1966. Bensulide was incorporated in soil at 8 and 12 lb/A before planting and was also sprayed over the tobacco after planting. Siduron was sprayed over the tobacco after planting at rates of 8 and 12 lb/A. Yields were not taken in this test. When bensulide was applied before planting, it caused little injury but injury was marked when bensulide was sprayed over the tobacco. Siduron reduced early growth at both rates of application.

DISCUSSION

Effects of chemicals on tobacco and weeds

The traditional emphasis on leaf quality in Connecticut tobacco presents a challenge to any chemical treatment designed to replace the hoe. A short growing season and a limited harvest period may also preclude the acceptance of any treatment that delays maturity, even if yields and quality are not impaired.

At dosages adequate to control weeds, most of the herbicides that were tested in Connecticut Broadleaf and Shade Grown tobaccos caused some injury, some of which could be considered minor in other crops. Of the herbicides tested over a period of several years, diphenamid meets the requirements for minimum hazard to tobacco better than any other. When applied at 3 lb/A before planting or 4 lb/A after planting diphenamid has controlled annual weeds as well as two hand hoeings and has provided little or no hazard to tobacco growth, yield, or quality.

Diphenamid also has been safely applied in tobacco seedbeds and around shade tents. At the present time diphenamid is the only herbicide with a label that makes it available for commercial use in binder or wrapper tobaccos.

With the herbicides vernolate, benefin, and trifluralin, timing of application and degree of incorporation with soil apparently are significant factors affecting their selectivity in tobacco. Because of their volatile natures these herbicides control weeds best when they are mixed into the soil and, therefore, are best adapted to use before planting. Applications after planting have consistently injured tobacco but applications of benefin and trifluralin at low rates harrowed into the soil before planting have caused little injury. Thus it seems that mixing into the soil not only improves weed control but reduces potential injury with these herbicides. Shallow mixing by chopping in with a rake, however, did not prevent injury with trifluralin. Klingman (3) reports that weed control and crop value in flue-cured tobacco were greater with benefin and vernolate when they were thoroughly mixed into soil to a depth of 2 to 6 inches before planting than when they were applied over tobacco after planting. Power-driven rotary hoes were most effective in mixing herbicides in soils in flue-cured tobacco but double disking also was satisfactory. Both the disk and springtooth harrow have given satisfactory results in our tests.

While not as dependent on soil incorporation as trifluralin, benefin, or vernolate, diphenamid also appears to be more effective when mixed into the soil. The general practice has been to apply diphenamid over transplants, but research and experience indicate that equally good and sometimes better results may be obtained if diphenamid is mixed into soil before planting. Cialone and Lossiter (2) also report more consistent control of weeds with soil incorporation of diphenamid before planting. Mixing of diphenamid into soil should be thorough and the dosage should be reduced to prevent possible setback of early growth of tobacco.

Although the above herbicides have been successful in controlling weeds as effectively as two hand hoeings in many tobacco fields, none has controlled all weeds. Annual grasses were controlled most effectively but certain broadleafed weeds such as ragweed, galinsoga, and horsenettle were resistant to treatment. Minimal effective herbicide dosages vary somewhat with soil type and content of organic matter. Soils higher in organic matter and clay can be expected to require higher dosages than those required by the sandy loam soils that predominate in the Connecticut River Valley.

Preplanting vs. postplanting treatments

Treatments that can safely be applied before planting offer several advantages over equally safe treatments that must be applied after planting. In Shade Grown tobacco the poles and variable row spacings make it difficult to operate boom sprayers after the tobacco is planted. Applications before planting would alleviate the problem. In both Shade and open-field tobacco, transplanting may take place over a period of a few weeks. Treatments after planting and before weed emergence will

require several days of application or transplanters equipped with sprayers. If applications are delayed until all of the tobacco is planted, weeds will have emerged in most fields and a hand hoeing may be necessary because most soil-applied herbicides have little effect on emerged weeds. With applications before planting the timing of application is not critical because working the soil after treatment provides a weed-free soil and gives the herbicide its maximum advantage.

Effects of herbicide residues on cover crops

An important consideration in the use of diphenamid in tobacco fields is its harmful effect on cover crops. Trifluralin, benefin, and vernolate, while potentially more hazardous to tobacco at effective rates, create less of a hazard to cover crops. Diphenamid residues in soil do not prevent germination of small grains but they can prevent establishment of a good soil cover. Plowing before planting cover crops greatly reduces the problem; deep disking is better than shallow disking and late planting is better than early planting (early October rather than early September). Lower soil temperatures in October decrease herbicide activity and allow cover crops a better chance of escaping injury. Late planting and the heavy rainfall in the 1967 season probably account for the lack of effect of diphenamid on the rye cover crop that year. Applying diphenamid before planting at lower rates than those required for use after planting also can be expected to reduce the hazard of injury to fall cover crops.

Diphenamid leaches in the soil and has been found in small amounts throughout the 0- to 9-inch depth in Kentucky soils 10 months after application (3). Most of the residue was concentrated in the upper 3 inches 4 months after application. Soils higher in organic matter can be expected to retain more of the residue than soils lower in organic matter. Organic matter content of tobacco soils in the Connecticut Valley is relatively low (2 to 3 per cent) and with normal rainfall considerable leaching of diphenamid to lower soil horizons can be expected.

Although we have not reapplied diphenamid annually for several years on the same tobacco fields, we have applied it annually for 6 years in an experiment in woody ornamentals on a sandy loam soil. Applications were made at 4 and 8 lb/A each year in June and oats were seeded in the plots each September. The data obtained on residual weed control and injury to the oat cover crop indicate that diphenamid residues are not building up in the soil. In fact, less injury to cover crops has been obtained in the last 3 years of the trial than during the first 3. Therefore, it appears unlikely that annual applications of diphenamid in tobacco fields will create an increasing hazard to sensitive crops.

Summary

In many experiments over several years herbicides have been evaluated in Connecticut Broadleaf and Shade Grown tobacco. Effects on weeds, tobacco growth, yield, and quality, and residual effects on cover crops were determined. All materials or types of application that are not currently labelled for use on tobacco are discussed in this report for in-

formation of the reader only. The herbicide labels should be consulted for current approved uses.

Of the many herbicides included in our experiments, diphenamid was the safest to tobacco when applied before or after planting. Diphenamid also proved harmless to tobacco when applied in a tobacco seedbed or alone and in combination with paraquat around shade tents.

Applications of diphenamid at 4 pounds of active ingredient per acre over tobacco after transplanting provided weed control equal to that obtained with at least two hand hoeings in many fields. Certain annual and perennial weeds were resistant to diphenamid treatments. Applications of diphenamid before planting offer several advantages and appear harmless to tobacco transplants when the diphenamid is thoroughly mixed into soil with a disk or springtooth harrow. Residual effects of diphenamid can prevent good growth of a cover crop in the fall. Several ways of minimizing these effects have been discussed.

References

1. Ahrens, J. F. 1963. Chemical control of weeds in Connecticut Shade Grown and stalk-cut tobacco. Proc. NEWCC 17:240-247.
2. Cialone, J. C., and G. Lossiter. 1968. Studies on the field performance of preplant and preemergence applications of diphenamid. Proc. NEWCC 22:236-239.
3. Jones, G. E., H. D. Dubey, and J. F. Freeman. 1964. Persistence of diphenamid in tobacco field soils. Weeds 12:313-315.
4. Klingman, G. C. 1967. Weed control in flue-cured tobacco. Tob. Sci. 11:115-119.

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THE CONNECTICUT
AGRICULTURAL EXPERIMENT STATION
NEW HAVEN, CONNECTICUT 06504

James G. Horsfall
Director

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