problems in soil. Although DCPA induced growth regulating effects such as inhibiting adventitious root formation on vines, increasing diam of crown stems, and inhibiting fibrous root development on crown stems (6), yields were not reduced at the concn used. Weed-control effectiveness of DCPA tends to fade late in the season in the sand soil used in these experiments. This can be partly offset by using higher rates and by waiting until a few days after transplanting before applying the herbicide.

In 1971, a trial was conducted to compare application of DCPA by herbigation vs. sprayer application. About half a usual irrigation set was run before DCPA was applied by injection into the system. Rate was 11.2 kg/ha with both application methods. Applications were made after plots were cultivated once to level the soil surface.

Herbigation was as effective as sprayer application for week control and it reduced cost of application. Herbigation seems most useful when irrigation for supplying water corresponds with time for applying herbicides. If herbigation is used when the crop does not need water, the process may offer no cost reduction compared with sprayer application.

DCPA produced, along with effective weed control, interesting growth-regulating effects on sweetpotato plants. A replicated experiment conducted to further investigate the growth-regulating effects indicated that the mean diam of 'Nemagold' crown stems at ground level was 11 mm in control plots and 18 mm in plots treated with DCPA at 8.4 kg/ha. DCPA may exert its growth regulating influence by inhibiting cell division and differentiation (1, 4).

Literature Cited

1. Bingham, W. W. 1968. Effect of DCPA on anatomy and cytology of roots. *Weed Sci.* 16:449-452.
2. Greg, J. K., and Ahmed S. Al-Tikriti. 1966. Effects of herbicides on some chemical components of sweetpotato foliage and roots. *Proc. Am. Soc. Hort. Sci.* 88:466-471.
3. Hernandez, T. P., R. J. Constantin, J. R. Barry, and B. W. Wascom. 1969. Herbicides for weed control in sweetpotatoes. *La. Agr.* 12(3):10-11.
4. Nishimoto, R. K., and G. F. Warren. 1971. Stem abnormality induced by DCPA. *Weed Sci.* 19:343-346.
5. Peterson, Lewis E., M. LeRon Robbins, and J. L. Weigle. 1970. Weed control in sweetpotatoes. *Iowa Farm Sci.* 25(1):9.
6. Robbins, M. LeRon, and Lewis E. Peterson. 1970. Reduction of adventitious root formation on vines of sweetpotato (*Ipomoea batatas* Poir) in Dacthal-treated soil. *Hort. Res.* 10:151-152.
7. Taylorson, R. B. 1965. New herbicides for sweetpotatoes. *Proc. Am. Soc. Hort. Sci.* 86:517-522.

Cabbage Response to Fluorodifen and Nitrofen under Field Conditions[1]

J. F. Pereira, H. J. Hopen and W. E. Splittstoesser[2]

University of Illinois, Urbana

Abstract. **2,4 Dichlorophenyl-*p* nitrophenyl ether (nitrofen) was more injurious to field transplanted cabbage at the 3 leaf than at the 6 or 9 leaf stages; 'Hybelle' was more tolerant than 'Rio Verde'. 2,4 Dinitro-p-trifluoromethyl phenyl ether (fluorodifen) caused greater injury than nitrofen when applied as a preemergence treatment on direct-seeded cabbage or as a postemergence treatment on transplanted cabbage.**

Nitrofen has proved to be a practical herbicide for use in cole crops (2, 4). Limited nitrofen translocation in several species has recently been reported (1, 7) and the site in cabbage which confers resistance differs from the site of herbicidal action (6, 7). In greenhouse tests the cuticle of 'Hybelle', a tolerant cultivar, reduced penetration of nitrofen but once the herbicide enters and reaches the site of action, the plant shows injury symptoms. Conditions favoring low absorption or slow penetration into living cells reduce the severity of symptoms. Thus, manipulation of these conditions can influence susceptibility.

Our objective was to study the field response of cabbage cultivars 'Hybelle' (nitrofen tolerant) and 'Rio Verde' (nitrofen susceptible) (2), to nitrofen and fluorodifen, both herbicides of the diphenylether family.

Two formulations of notrofen were tested: 1) emulsifiable concentrate (EC), containing 240 g nitrofen/liter and 2 emulsifiers: 3.6% Triton X-152 and 2.4% Triton X-172[3] (alkyl phenoxypolyethoxy ethanols); and 2) a wettable powder (WP) containing 50% nitrofen. Fluorodifen was applied as an emulsifiable concentrate containing 360 g fluorodifen/liter.

The experiments were conducted in 1970, on Drummer silty clay loam soil at the Drug and Horticulture Experiment Station, University of Illinois, Downers Grove. Plants were direct seeded and sprayed at planting or transplanted at several different leaf stages and sprayed 7 days later. A bicycle sprayer travelling at 3 km/hr, delivering 600 liter/ha at 2 kg/cm^2 pressure was used to apply 5 kg/ha of liquid unless otherwise indicated. Sucrose was applied as a 5% solution the day before, simultaneously with or the day following nitrofen application. Plots were hand-weeded 35 days after establishment.

Visual injury was obtained by rating, at several time intervals after spraying, on a 0 (no injury) to 4 (plant death) scale. Cabbage was harvested when commercially mature.

Randomized complete block designs were used with 3 replications. Each plot consisted of 10 transplanted plants or 45 seeds.

Effect of nitrofen: Damage to transplanted cabbage depended upon the concn of nitrofen applied (Fig. 1). 'Rio Verde' was affected most severely. There was no increase in toxic effect on 'Hybelle' from 5 to 10 kg/ha nitrofen. Most 'Rio Verde' plants eventually died at 10 kg/ha nitrofen. The degree of injury was also a function of the time elapsed after spraying. At 20 days, there were only slight symptoms on those 'Rio Verde' plants which had survived the high rate.

In both cultivars, injury was also dependent upon plant age (Fig. 2). 'Rio Verde' was severely affected when sprayed at the 3-leaf stage, and injury decreased with increasing age of plants at time of application. Recovery rate was similar for both cultivars and irrespective of plant age at the time of spraying. However, 'Rio Verde' sprayed at the 3-leaf stage did not recover to the extent that 'Hybelle' did since yield reduction occurred (Fig. 3). Differences in yield could not be assigned to other causes.

Nitrofen injury to transplanted cabbage is dependent on formulation

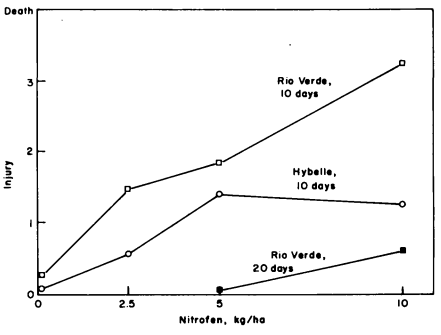

Fig. 1. Degree of injury (0-4 basis) 10 and 20 days after spraying transplanted 'Hybelle' and 'Rio Verde' cabbage with several concn of emulsifiable concentrate nitrofen.

[1]Received for publication September 8, 1971.

[2]Department of Horticulture. Present address of senior author: Escuela de Agronomia, Universidad de Oriente, Jusepin, Monagas, Venezuela.

[3]Rohm and Haas Company.

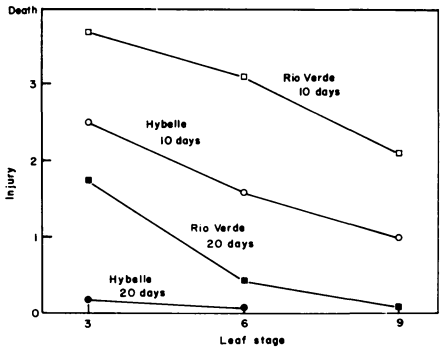

Fig. 2. Degree of injury (0-4 basis) 10 and 20 days after spraying emulsifiable concentrate nitrofen on cabbage which was transplanted at different leaf stages.

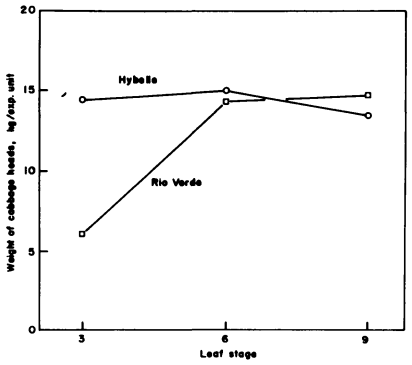

Fig. 3. Cabbage yield from plants transplanted at different leaf stages and sprayed 1 week after transplanting with emulsifiable concentrate nitrofen.

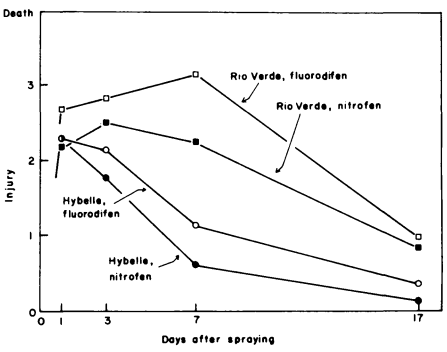

Fig. 4. Differential cultivar injury caused by the emulsifiable concentrate formulation of nitrofen and fluorodifen sprayed after transplanting.

(7). Both cultivars were injured by the emulsifiable concentrate formulation in greenhouse tests (the wettable powder formulation was less toxic). Plants recovered slowly, but 17 days after spraying showed no external indication of injury.

Sucrose application reduced nitrofen injury in the greenhouse (6), but had no effect in field studies (data not presented).

The effect of fluorodifen was to cause greater injury than nitrofen when applied postemergence (Fig. 4), although the cultivar pattern of tolerance remained unaltered. Differential tolerance between cultivars disappeared when herbicides were applied preemergence (Table 1) as germination of both cultivars was reduced by fluorodifen. There were no differences in germination due to nitrofen formulation when it was applied preemergence immediately after seeding.

Injury to transplanted cabbage decreased with increasing plant age at herbicide application (Fig. 2 and 3), and may be directly related to the increasing cuticle thickness with plant age (3). Plants grown under conditions favoring heavy cuticle deposition are resistant (7).

The emulsifiable concentrate of nitrofen, as a postemergence treatment, was injurious (Fig. 1), although fluorodifen was more injurious than nitrofen (Fig. 4). The relative tolerance of the 2 cultivars remained unchanged: 'Rio Verde' was susceptible and 'Hybelle' was relatively tolerant. Plants recovered almost completely by 17 days after spraying. It is unknown why fluorodifen is more injurious, perhaps it penetrates faster or is degraded at a slower rate than nitrofen. However, fluorodifen in preemergence applications reduced the germination of both cultivars (Table 1) and at 5 kg/ha fluorodifen, no 'Rio Verde' seed germinated.

If low tolerance cultivars, as 'Rio Verde' are grown, the wettable powder formulation of nitrofen applied after post-transplant growth has occurred should minimize injury and maximize recovery.

Table 1. Effect of field applications of emulsifiable concentrate formulations of nitrofen and fluorodifen at 5 kg/ha upon germination of 2 cabbage cultivars (Drummer silty clay loam soil).

Cultivar	Herbicide	Germination (% of untreated)
Hybelle	nitrofen	60
	fluorodifen	25
Rio Verde	nitrofen	78
	fluorodifen	0

Literature Cited

1. Hawton, D. and E. H. Stobbe. 1971. The fate of nitrofen in rape, redroot pigweed and green foxtail. *Weed Sci.* 19:555-558.
2. Hopen, H. J. 1969. Selectivity of nitrofen between cabbage cultivars. *HortScience* 4:119-120.
3. Kolattukudy, P. E. 1970. Biosynthesis of cuticular lipids. *Ann. Rev. Plant Physiol.* 21:163-192.
4. Lange, A. H., H. Agamalian, R. Brendler, and M. Snyder. 1968. Weed control in cole crops. *Calif. Agr.* 22:10-12.
5. Moreland, D. E., W. J. Blackmon, H. G. Todd, and F. S. Farmer. 1970. Effect of diphenyl ether herbicides on reactions of mitochondria and chloroplasts. *Weed Sci.* 18:636-642.
6. Pereira, J. F., W. E. Splittstoesser, and H. J. Hopen. 1971. Response of plant tissues to nitrofen. *Weed Sci.* 19:662-666.
7. _____, _____, and _____. 1971. Mechanism of intraspecific selectivity of cabbage to nitrofen. *Weed Sci.* 19:647-651.

Effect of Day and Night Temperature on Tolerance of Solanaceous Vegetables to Diphenamid[1]

Y. Eshel[2] and J. Katan[3]

The Hebrew University of Jerusalem, Rehovot, Israel

Abstract. The tolerance of eggplant (*Solanum melogena* L.), pepper (*Capsicum annuum* L.), and tomato (*Lycopersicon esculentum* Mill.) sown in soil containing N,N-dimethyl-2,2-diphenylacetamide (diphenamid) in controlled environment chambers was markedly temp dependent. An increase of temp during the light period from 20°C to 30° increased phytotoxicity of diphenamid, while temp increase during the dark period from 15° to 20° decreased phytotoxicity. Although some differences among the 3 species in their response to diphenamid were noticed, all of them were affected similarly by temp regimes.

The performance of diphenamid, a common herbicide used preemergence for selective weed control in solanaceous crops, is often inconsistent as regards efficiency in weed control and degree of crop tolerance. Inadequate tolerance has resulted in occasional damage to field-seeded tomato and pepper seedings (7, 11). An attempt has been made to correlate the injury to tomato seedlings grown under different growth conditions with various climatic factors (7, 8). This report deals with the influence of different temp regimes at the early stages of seedling development of 3 solanaceous species on their response to presowing treatments of diphenamid.

The experiments were carried out in controlled environment growth chambers. Temp are accurate within ± 1°C, light intensity was 1500 ft-c with a

[1]Received for publication December 13, 1971.

[2]Department of Field and Vegetable Crops, Faculty of Agriculture.

[3]Department of Plant Pathology and Microbiology, Faculty of Agriculture.