Preplant Weed Control from Nortron EC and FL Tank Mixtures, 1976-80

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Received for Publication January 23, 1981

INTRODUCTION

Researchers have made rapid progress during the past decade on chemical weeding in sugarbeets. Treatments have been discovered and devised that are more crop selective and weed effective, especially at lower chemical dosages. In addition, chemical weeding is more consistent because chemical activity of new herbicides are better and many of them persist in soil for a longer period of time during the growing season.

For example, ethofumesate (Nortron) released in 1978 permitted several new experimental and commercial preplant tank mixes. Among these, Nortron plus cycloate (Ro-Neet), diethatyl ethyl (Antor), pyrazon (Pyramin), and diclofop-methyl (Hoelon) are most effective. Weed control results are quite universal from these mixtures as shown by workers in Colorado (6, 8, 9, 10), Wyoming (3), Utah (4), California (5) and Minnesota-North Dakota (1, 2).

The objective of this study was to determine if weed control and crop tolerance differences exist between Nortron EC (emulsifiable concentrate) and FL (flowable) formulations when tank-mixed with the preplant herbicides referred to above. Field results have shown that no differences occurred between the two formulations of Nortron when these two formulations were applied singly as preplanting treatments.

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MATERIALS AND METHODS

Spring trials were established during 1976-80 under commercial production conditions every year in Colorado and Nebraska, and intermittently in Kansas, Montana, and Wyoming. Although soil and surface moisture varied considerably each year, conditions, supplemented by surface irrigation, were favorable for consistent chemical activity and rapid plant growth. Soil textures varied among research sites, and consisted of loam, sandy clay loam, silt loam, and clay soils. Soil pH levels ranged from 7.3 to 8.1, averaging 7.7; and organic matter precentages ranged from 0.9 to 2.8%, averaging 1.7%. At planting, soil temperatures averaged 16° C at the 5-cm depth, with ambient air temperatures ranging from 10 to 20° C at 5-cm above ground level for the five-year period.

Natural weed seed infestations were supplemented by weed seed which was sown in an 18-cm band simultaneously with planting of sugarbeet seed and application of herbicides. Predominant weeds present in the untreated controls were redroot pigweed, Amaranthus retroflexus L.; kochia, Kochia scoparia (L.) Schrad.; green foxtail, Setaria viridis L. Beauv.; and foxtail millet, S. italaca. Minor weeds were common lambsquarters, Chenopodium album L.; black nightshade, Solanum nigrum L.; cutleaf nightshade, S. triflorum Nutt.; wild buckwheat, Polygonum convolvulus L.; shepherdspurse, Capsella bursa-pastoris L. Medic; common purslane, Portulaca oleracea L.; Russian thistle, Salsola kali L.; and barnyardgrass, Echinochloa crus-galli [L] Beauv. Weed densities averaged 290 weeds per sq. m with a botanical composition of 70% broadleaf species and 30% grassy weeds.

Monogerm sugarbeet seed, MONO HY D_2 or A_4, was sown at 4 seeds per 30.6 cm of row at 2.5 cm soil depth.

Herbicides were power-incorporated to a depth of 3.8 cm simultaneously with crop planting which occurred in late March through April. Herbicides were applied at either a constant or logarithmic rate in a 18 cm band at 132 l/ha. A tractor-mounted sprayer was operated at 3.62 km/h at 2.25 kg/cm^2 with

LE-2 nozzle tips. Plot size in constant rate plots measured six rows spaced 56 cm apart by 9 m. The logarithmic plots were 2 rows by 30.5 m with the original herbicide dosage being decreased by 50% for every 7.2 m of tractor travel.

Chemicals evaluated preplanting were Nortron EC and FL in tank mixes with Antor, Endothall, Hoelon, Pyramin, or Ro-Neet. Comparable active dosages were evaluated each year for the Nortron formulations when tank-mixed with the other herbicides and applied either as constant or logarithmic rates.

Treatments were arranged in randomized complete blocks and were replicated 2 or 3 times in logarithmic plots and 3 or 4 times in constant-rate plots. Weed and sugarbeet plant counts were made approximately five weeks after chemical application. Observations in logarithmic-rate plots were taken in each row at a place estimated to have the greatest percentage weed control, with the least crop injury, and in the four innermost rows of each constant-rate plot within a quadrat which measured 7.6 cm by 1.2 m. Sugarbeet tolerance was estimated subjectively before sugarbeets were thinned.

Weed control and crop tolerance data from these trials were subjected to statistical analysis and the results are reported as percentage of the untreated controls. Results from constant-rate- and logarithmic-rate plots are combined due to similarity of yearly and average responses between testing methods.

RESULTS AND DISCUSSION

Weed Control

Excellent control of broadleaf species resulted from all mixtures regardless of Nortron formulation (Table 1). Total weed control averaged 91 percent for Nortron EC mixtures and 89 for Nortron FL mixtures. Most Nortron flowable mixtures required an average of 0.30 kg/ha more Nortron to obtain equivalent weed control than that needed with the Nortron emulsifiable concentrate mixtures. Nortron mixtures with Ro-Neet were more effective per unit of active than the other treatments. Schweizer (8) showed that Nortron EC + Ro-Neet, although not clearly

Table 1. Percent weed control and sugarbeet injury when five preplant herbicides were tank-mixed with Nortron EC or FL formulations, 1976-80.

Treatment	No. of Comparisons	Avg. Dose	Sugarbeet Injury	Sugarbeet Stand[a]	Weed Control Pigweed	Kochia	Other[b]	Bdlv.[c]	Grass	Total
		(kg/ha)					(%)			
Nortron EC +										
Ro-Neet	17	1.6+1.3	16	111	97	80	89	90	96	93
Pyramin	13	1.8+2.2	12	110	95	65	93	88	95	90
Antor	12	1.9+1.9	16	110	94	74	78	87	98	91
Endothall	11	2.6+2.0	14	113	91	76	82	84	93	88
Hoelon	14	2.1+1.9	13	116	94	77	80	87	99	92
Nortron FL +										
Ro-Neet	16	1.9+1.6	17	113	96	60	85	82	96	88
Pyramin	12	2.3+1.8	13	106	94	66	88	87	96	90
Antor	12	2.1+2.1	13	113	97	64	78	85	92	88
Endothall	8	2.6+2.0	15	111	92	82	88	89	92	90
Hoelon	14	2.5+2.2	11	115	86	77	76	80	97	88
Avg. Nortron E Mixtures		2.0+1.9	14	112	94	74	84	87	96	91
Avg. Nortron F Mixtures		2.3+1.9	14	112	93	70	83	85	95	89
Weed Density/sq. m untreated			--	8.2	81	45	39	165	125	290

[a]Sugarbeet stand as number of seedlings/m of row.

[b]Other broadleaf weeds except redroot pigweed and kochia.

[c]Average broadleaf weed control.

synergestic, gave observed weed responses greater than calculated "expected responses".

Among weed species, control of broadleaf and grassy weeds was approximately equal regardless of Nortron formulation. Kochia control was highest per unit of active ingredient when Nortron EC was tank-mixed with Ro-Neet or Antor than when the latter two chemicals were applied with Nortron FL. Assumptive computations reveal that if the stand of kochia is reduced 80% before thinning with a mixture of Nortron EC + Ro-Need (1.6+1.3 kg/ha), and the remaining stand is reduced by an additional 80% during thinning, then seven kochia plants would remain per 30.5 m of row. If these weeds compete with sugarbeets until harvest, root yields would be expected to be reduced by 17% (7). Similar reductions in the stand of kochia would be expected from all Nortron FL tank-mixes except those that included Endothall or Hoelon (Table 1).

Sugarbeet Tolerance

No crop tolerance differences were detected between the two Nortron formulations when tank-mixed with the other pre-plant herbicides (Table 1). In fact, a 12% average increase in crop seedling stand resulted from herbicide application when compared to the untreated check at pre-thinning. Seedling beet retardation ranged from 11 to 17% for chemical applications which is well within practical limits (Table 1). Researchers in Utah (4) and at other locations (1, 5, 10) have reported similar crop tolerances for the mixtures evaluated in this study.

SUMMARY AND CONCLUSIONS

Five year results revealed that no practical efficacy or crop tolerance differences occurred between preplant applications of Nortron EC or FL when tank-mixed with Antor, Endothall, Hoelon, Pyramin, or Ro-Neet. Total broadleaf species weed control ranged from 80 to 90% when compared to the untreated controls. Nortron EC or FL when tank-mixed, averaged 91 and 89 percentage points weed control, respectively. More Nortron FL active ingredient was required in tank mixes for equivalent weed control than that in EC tank mixes.

ACKNOWLEDGEMENTS

Appreciation is expressed to American Hoechst Corporation, BASF Wyandotte Corporation, FBC Chemicals Inc., Pennwalt Corporation, and Stauffer Chemical Company for their cooperation.

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