III. EFFECTS OF MEFLUIDIDE

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Possible chemical treatments to improve late summer-fall forage quality of crested wheatgrass include curing with paraquat (1,1'-dimethl-4,4 bipyridinium ion) or treatment of plants with mefluidide (N-[2,4-dimethyl-5-([(trifluoromethyl)sulfonyl]amino]-phenyl]acetamide), a growth regulator from 3M Company. Paraquat has not been cleared for curing forage on rangelands, but recently there have been renewed interest and efforts directed toward obtaining a label for this purpose. Mefluidide, being applied under an experimental label, has been used to prevent reproductive shoot development in tall fescue (*Festuca arundinacea*) in Kentucky, simultaneously reducing fiber and increasing soluble carbohydrate and N-content in midsummer. Beginning in 1982, mefluidide was applied to crested wheatgrass plants at the Eastern Oregon Agricultural Research Center in Burns, Oregon, in hopes of reducing reproductive shoot development and improving forage quality in late summer and fall.

PROCEDURES

Plots (10 x 90 feet) of established crested wheatgrass were treated with 0, 0.125, 0.25, and 0.375 pounds of mefluidide (active ingredient) per acre on May 14, 1982, and May 14, 1983. Foliage was sprayed with a water mix at 10 gallons per acre. Spray was applied before floral differentiation in 1982 and during floral differentation in 1983. Separate subplots from six replications were sampled twice monthly from July 1 to October 15 each year for forage yields and forage quality. Forage samples were analyzed for ash, crude protein, *in vitro* digestible organic matter, and neutral detergent fiber. The fractions of crude protein and *in vitro* digestible organic matter are expressed on an organic matter basis, while neutral detergent fiber is presented as ash free. Seed heads or reproductive shoots were counted in August each year.

RESULTS AND DISCUSSION

Reproductive shoot numbers were decreased 4.1 to 5.9 per square foot of ground area in 1982 and 9.3 to 17.4 per square foot in 1983 (Table 1). Many of the inflorescences were simply reduced in size and remained enclosed in the leaf sheath, with reproductive shoots protruding through the side of the leaf sheath.

Reduction of reproductive shoot numbers reduced forage yields during both years (Table 2). In 1982, mefluidide reduced average yields about 272 to 412 pounds per acre. In 1983, yields were reduced approximately 343 to 975 pounds per acre with the 0.25 and 0.375 pounds per acre rates and 0 to 630 pounds per acre with the 0.125 pound per acre rate.

Table 1. Reproductive shoots (numbers/square foot) of mefluidide treated crested wheatgrass during 1982 and 1983 at the Squaw Butte Experiment Station

Mefluidide rate pounds/acre	1982	1983
0.000	6.5	19.2
0.125	2.4	9.9
0.250	1.2	5.0
0.375	0.6	1.8

Table 2. Forage yields (pounds/acre) of mefluidide-treated crested wheatgrass during July 1 - October 15, 1982 and 1983, at the Squaw Butte Experiment Station

Mefluidide rate pounds/acre	1982							
	July		August		September		October	
	1	15	1	15	1	15	1	15
0.000	898	997	1306	1134	1139	1187	896	1060
0.125	711	900	827	796	777	812	784	836
0.250	585	660	803	676	771	762	677	694
0.375	655	687	625	654	704	705	676	614

Mefluidide rate pounds/acre	1983							
	July		August		September		October	
	1	15	1	15	1	15	1	15
0.000	1658	1573	1962	1725	1358	1656	1657	1212
0.125	1347	1702	1328	1094	1341	1248	1224	886
0.250	777	1020	1007	750	868	860	621	926
0.375	821	703	782	750	802	718	702	812

Ash content of crested wheatgrass forage increased 3.1 to 4.6 percent in 1982 and 2.2 to 6.6 percent in 1983 with mefluidide application (Figure 1). Treated plants, with fewer reproductive shoots, were more susceptible to soil contamination than untreated plants. However, we have not determined whether the increase in ash is from soil contamination or increased uptake of minerals including silica caused by treatment. Forage quality fractions were adjusted to an ash-free organic base to reduce the effect of differential soil contamination, and to allow comparisons of quality changes in the organic fraction of the plants.

Reduction in reproductive shoot numbers definitely improved forage quality during both 1982 and 1983. Crude protein content of untreated plants was less than the 5.8 percent, commonly reported as being required by a dry pregnant cow, on all dates in 1982 and 1983 (Figure 2). Crude protein percentage of forage, treated with mefluidide at 0.25 and 0.375 pounds per acre, remained above 5.8 percent for at least 2 weeks longer during July of 1982 and 1983. However, crude protein decreased to below 5.8 percent with all treatments by early August of both years. The increase in crude protein content in fall 1982 occurred as a result of regrowth caused by fall rains. Protein contents were consistently greater in treated plants, averaging 0.9 to 1.9 percent more in 1982 and 0.7 to 1.8 percent in 1983.

In vitro digestible organic matter has been determined for only 1982 forage samples (Figure 3). Plants, treated with 0.25 and 0.375 pounds mefluidide per acre, contained significantly more digestible organic matter than untreated plants or those treated with 0.125 pounds per acre except during mid-August and early September. Digestible organic matter content decreased below 50 percent in untreated and treated plants in mid-September and early October, respectively.

Neutral detergent fiber increased in crested wheatgrass plants as the growing season progressed (Figure 4). However, neutral detergent fiber content decreased an average 2.7 to 4.7 percent in 1982 and 3.7 to 7.7 percent in 1983, with mefluidide treatment.

CONCLUSIONS

The increase in forage quality, attained with mefluidide, suggests a higher quality forage could be produced for summer and early fall. The increase in ash content and the reduction in forage yields, attained with mefluidide, however, may be concerns. If the increased ash content represents an increase in essential minerals it would be beneficial, but if the increase in ash represents an increase in silica, the effect would not be beneficial since an increase in silica is associated with decreased digestibility. The decrease in forage yields reflects the reduction in reproductive shoot numbers. Crested wheatgrass reproductive shoots at this time of the year are of questionable value for maintaining a cow, and many shoots are broken and fall to the ground. The reduction of reproductive shoot numbers may also reduce spot grazing and the abundance of wolf plants.

At the time of writing, mefluidide was not cleared for use in treating forages and was made available to us for supervised, experimental purposes only. Further evaluations of its effects on forages and detailed analyses of environmental residues and metabolites must be completed before it is submitted for registration. Until mefluidide is registered for forage application, it should not be applied to any source of livestock feed.

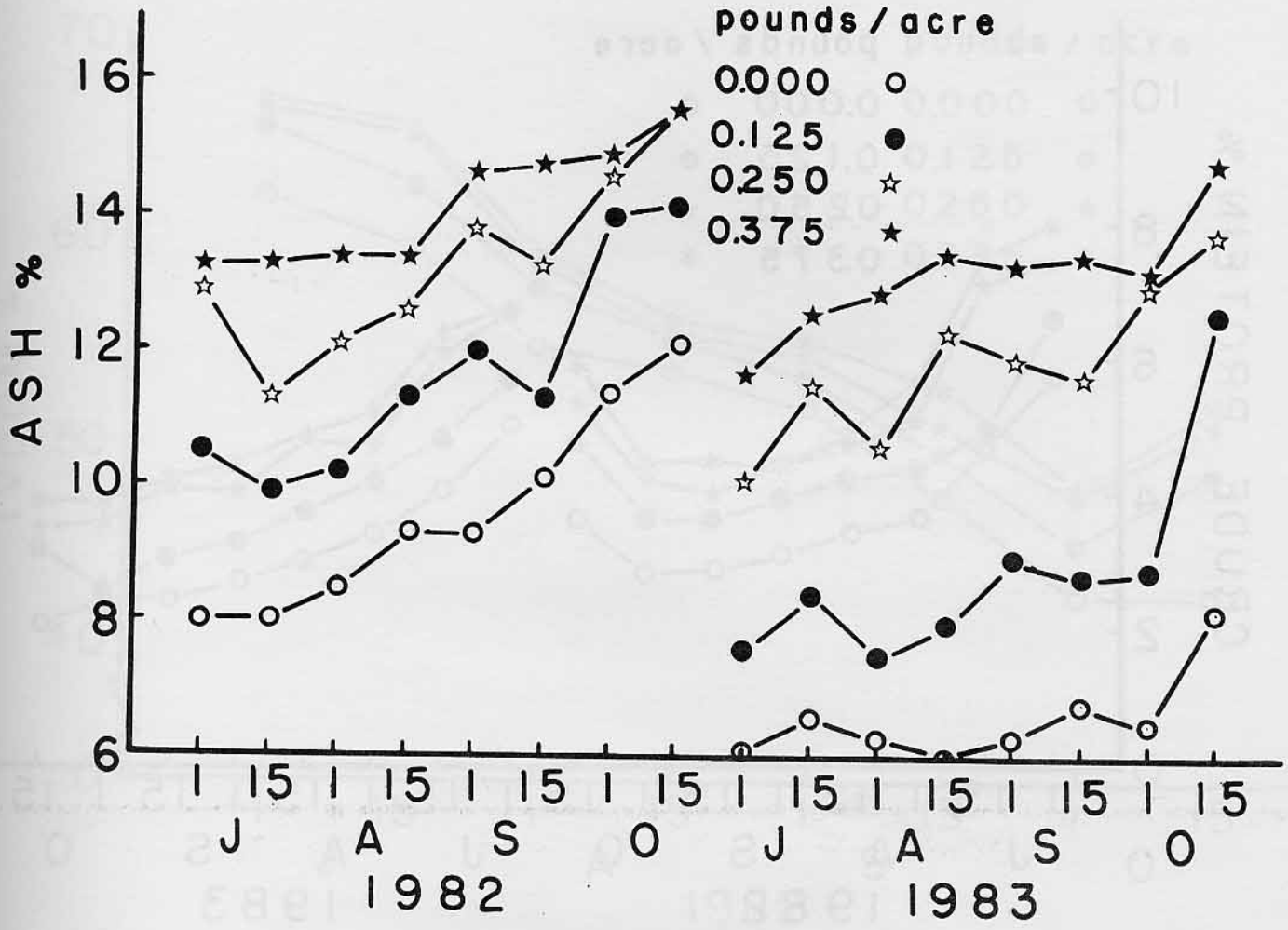

Figure 1. Percent ash of untreated crested wheatgrass plants and those treated with three rates of mefluidide during 1982 and 1983 at the Squaw Butte Experiment Station.

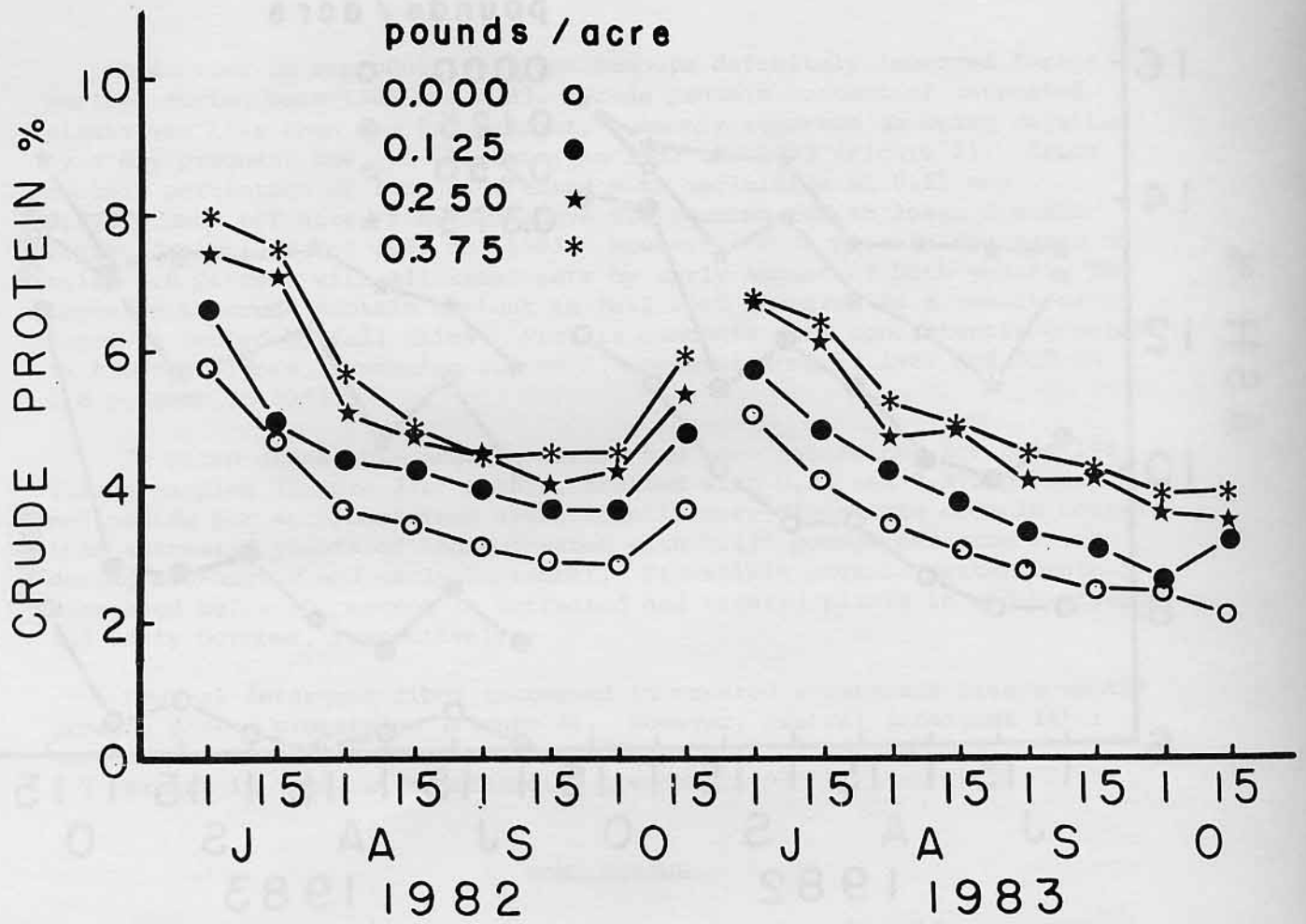

Figure 2. Percent crude protein of untreated crested wheatgrass plants and those treated with three rates of mefluidide during 1982 and 1983 at the Squaw Butte Experiment Station.

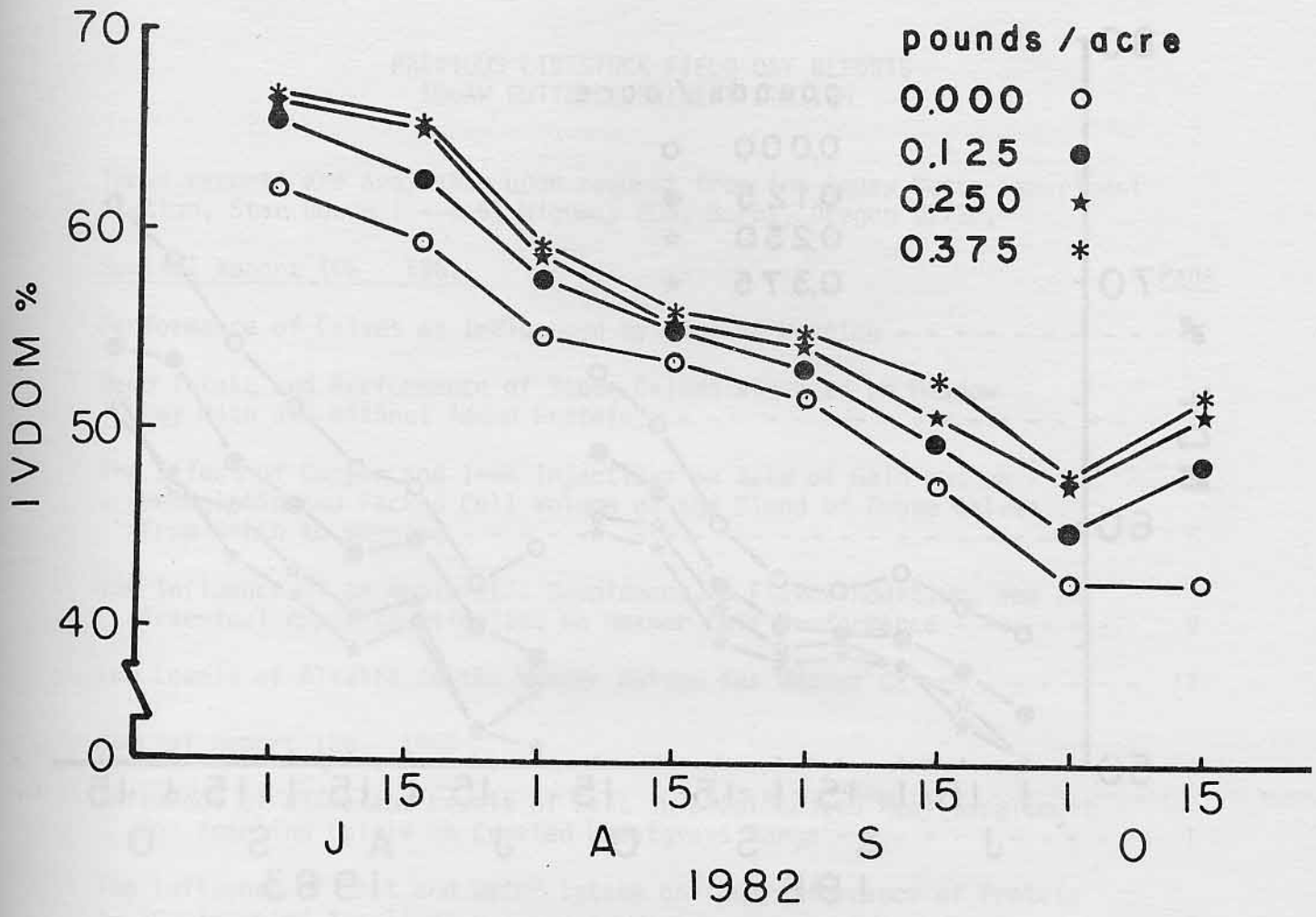

Figure 3. Percent *in vitro* digestible organic matter (IVDOM) of untreated crested wheatgrass plants and those treated with three rates of mefluidide during 1982 at the Squaw Butte Experiment Station.

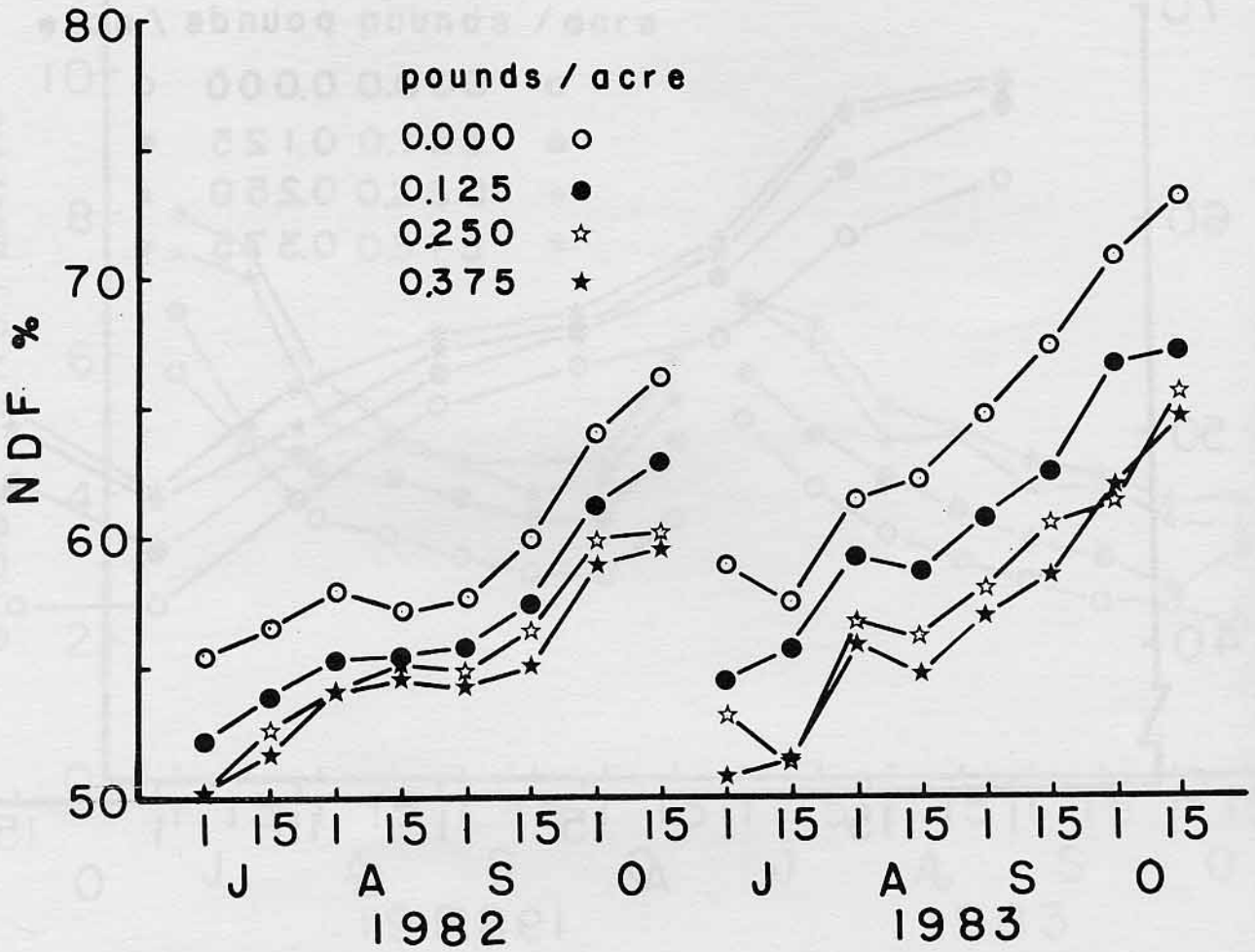

Figure 4. Percent neutral detergent fiber (NDF) of untreated crested wheatgrass plants and those treated with three rates of mefluidide during 1982 and 1983 at the Squaw Butte Experiment Station.