AGRONOMIC CROP SCIENCE REPORT

Research Extension

PROPANE FLAMER BURNING OF GRASS SEED FIELD STUBBLE 1/

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Introduction

Alternatives to open burning of grass seed fields after harvest include the possibility of the use of other heat sources, such as propane or diesel, to provide the thermal sanitation so beneficial to seed production. Propane flamers are presently used in mint fields for control of disease pests, however, in this case, removal of residue is not the issue but rather destruction of the pathogens within the plant tissue. Obviously, such a treatment could only be considered where a large portion of the straw would be mechanically removed prior to use of the flamer for burning remaining residue.

The flamer (burning propane) ignites the stubble remaining after removal of the straw, so that residue burning is facilitated over a wider range of environment conditions and provides the thermal treatment normally achieved in an open burn. With most of the residue removed, the potential for emission of pollutants from burning is greatly reduced. To ascertain the possible use of such an alternate heat source for thermal sanitation of grass fields, studies were undertaken comparing propane flamer burning with open burning. Most of the residue down to a 2-inch stubble height was removed by flail-chopping prior to flamer treatment. An estimated 3/4 ton of residue remained on the fields. Time of season and grass species, as well as speed of operation, were variables in these investigations. Of course, variation in residue load would affect fire spread, as well as soil surface temperature.

Results

The use of a propane flamer to burn grass seed field stubble is a high cost operation requiring the removal of residue to leave as little fuel as possible on the soil surface. The operation can also be hazardous because of risk of fire spread, depending on humidity and wind speed. Environmental conditions were found to influence the effectiveness of the treatment.

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Season of Treatment. Early propane burning is more beneficial than late burning, probably because of the presence of a lesser amount of green regrowth with higher moisture content and the higher moisture content of straw which is likely to occur later in the season (Table 1). Early propane flaming treatments resulted in seed yield response which compared favorably with open burn treatments (see Table 2). In almost every case, the seed yield with propane flaming was equal to or better than conventional open burning.

Table 1. Seed yields in four grass species when propane flaming 3/ was used early (August) versus late (October), 1967-68.

Species	Seed Yield (lbs/A)	
	Early	Late
Chewings Fescue	809	288
Perennial ryegrass	1221	763
Orchardgrass	1049	1149
Merion bluegrass	1200	967

Temperature and Speed. The results from studies on temperatures produced versus speed of operation indicate that the faster the operation the lower the temperature (Figure 1) perceived at soil surface and the shorter the duration of the temperature. A low temperature for a short period would be a concern in terms of effective sanitation. The temperature exposure from propane flaming may not be sufficient to destroy disease organisms and an increase in disease infestation might occur. No effort was made to evaluate disease control in this study since the fields were quite gree of disease from previous burning history. Open field burning shows quite a different temperature exposure pattern compared to flaming (Figure 2). Although temperatures may not be any higher, they are maintained for a longer period of time. The demonstration of survival of organisms (weed seed) on the soil surface lends further credance to the possibility that disease control would be inferior to open burning.

Smoke Emission. The technique of propane flamer burning of grass seed field stubble may contribute copious amounts of smoke because of the incomplete combustion of residue and smoldering after passage of the flame front. 4/ In addition, the smoke is retained at a low level in the atmosphere. The fate of this smoke and its effect remain to be assessed. Total emissions should be reduced because only a portion of the total residue is burned.

3/ Straw and stubble were chopped and removed prior to flaming and burning remaining residue.

4/ The amount of smoke produced would depend on the condition of the straw, regrowth, and the climatic condition, all of which influence the combustion process.

Table 2. Seed yields for five grass species when propane flaming was used, 5/ expressed as a percent of early open burn yields.

Species	Percent of early open burning
Chewings fescue	100
Creeping red fescue	90
Orchardgrass	101
Merion bluegrass	102
Highland bentgrass	108
Mean	100

Annual Versus Perennial Grass Crops. At present, burning of the residue after harvest is a primary method of weed control in annual ryegrass. Burning destroys the viability of seed on the surface of the soil. Studies with annual ryegrass showed that the temperature level and duration for propane flaming (approx. 2 1/2 mph) were not sufficient to destroy many of the weed seeds left in the fields after harvest and therefore a concomitant increase in weed infestation was noted. In fact, some promotion in the germination rate of weed seed was observed.

In perennial crops where herbicides are used extensively for weed control, propane flaming may be a more feasible alternative since it does remove the remaining residue after flail-chopping and removal of the straw, and appears to maintain seed yields. Where disease control may be less critical and for varieties or species sensitive to open burning, propane flamer burning may be a viable management practice for maintaining high seed yield. The technique might be particularly adaptable to the "close-clip" system of residue removal to provide an added measure of sanitation.

Conclusions

A propane flamer can be used to burn the residue remaining in seed fields after mechanical removal of straw and stubble. It seems most feasible in perennial grass crops, particularly those sensitive to burning, but has a high dollar and energy cost as compared to open burning. Early season treatment is most effective. Slower operating speeds provide the most effective thermal exposure.

5/ Straw and stubble were chopped and removed prior to flaming and burning remaining residue.

Propane flaming at rates above 2 mph in annual ryegrass failed to destroy weed seeds. This apparent limitation in thermal treatment also casts doubt on the ability of the flamer to destroy disease organisms, important in grass seed production. If the speed of travel is slow enough, satisfactory sanitation might be obtained. Smoke emission, although reduced, is still a problem and it is confined to lower levels of the atmosphere.

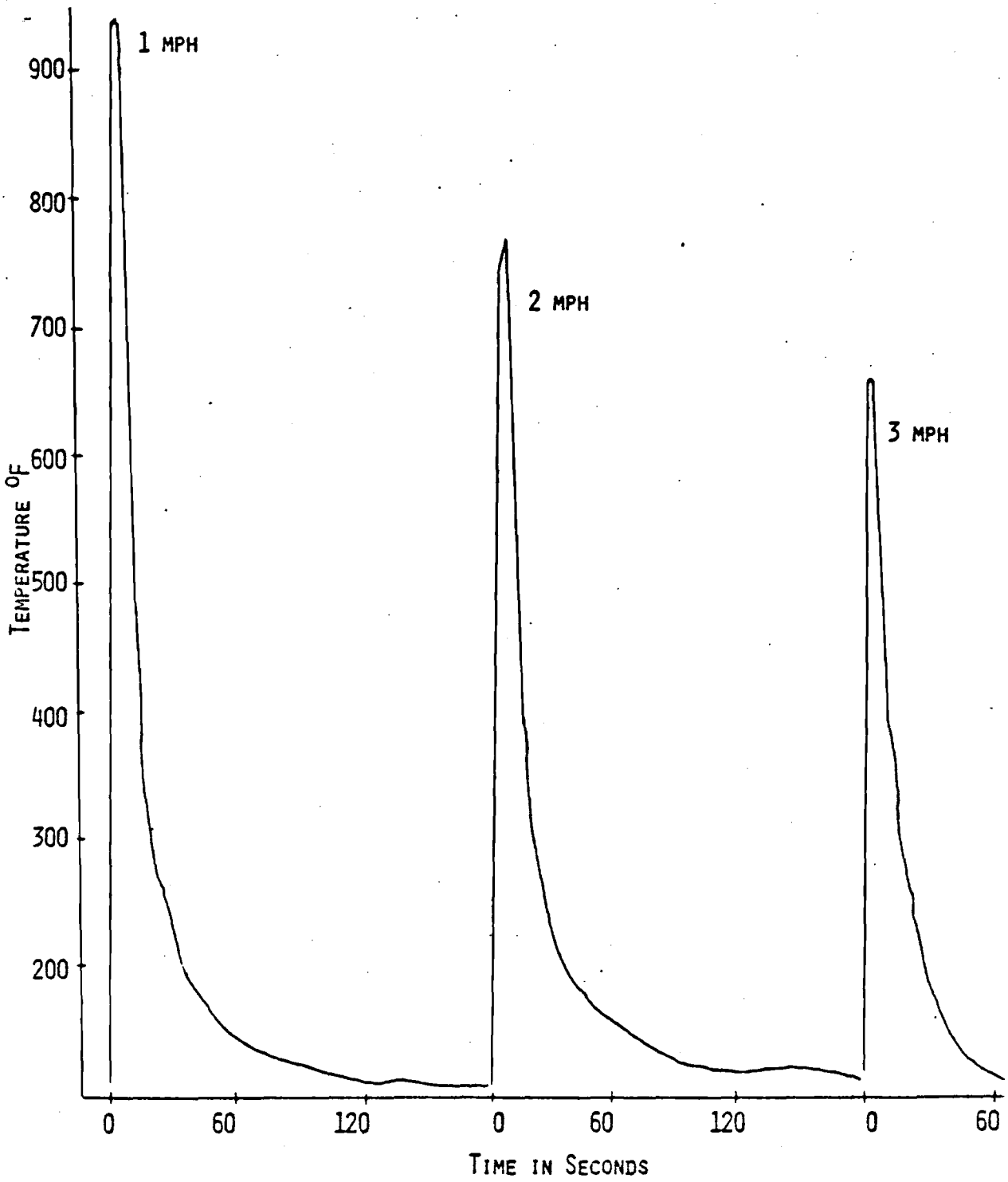

FIGURE 1. COMPARISON OF TEMPERATURE PROFILE AT 1/2" ABOVE GROUND SURFACE FOR PROPANE FLAMER AT VARIOUS SPEEDS OF OPERATION.

FIGURE 2. OPEN FIELD BURN TEMPERATURE PROFILES (ORCHARDGRASS).