Two years of Flaming Project at UNL Haskell Agriculture Lab in Concord NE

by Santiago Ulloa C.

There is an increased interest in organic production among farmers and industry in the United States and especially in our state, Nebraska. This interest is based on the consumer demand for environmentally friendly food. Weed control ranks as the number one problem limiting crop production. Hand weeding and cultivation are the most common methods for weed control in organic production. However, labor cost associated with hand weeding is high, and cultivation increases the chance of soil erosion and cause the emergence of new flushes of weeds. Propane flaming could be one alternative for weed control in organically grown field crops.

The purpose of flaming is to transfer heat from the flames to the plant leaf increasing the temperature of the plant cells. This increment in temperature causes coagulation of cell proteins and induces cell membrane rupture. After protein coagulation and leaf cell disruption, soil nutrients and water cannot be translocated causing major plant injuries or even plant death.

In order to optimize use of flaming as a weed control tool, the response of major weed species and crops must be determined. Depending on the desired level of weed control, or tolerable crop injury level, a propane dose could be selected to either control the weed, or reduce its growth thereby offsetting its competitive ability against the crop. Goal of our experiments in these two years (2007-2008) was to develop baseline information on crop and weed tolerance to broadcast flaming. The specific objective was to evaluate dose response for propane on several major weeds and field crops in Nebraska.

A series of field experiments were conducted during 2007 and 2008 to determine the response of crops and weeds to broadcast flaming utilizing different rates of propane. The species evaluated were: wheat, maize, sorghum, soybean, sunflower, red clover, alfalfa, barnyardgrass, green foxtail, velvetleaf, field bindweed, waterhemp, morning-glory, Venice mallow, kochia, yellow foxtail and red-root pigweed.

Flaming treatments were applied with the flamer mounted on a four-wheeler. The flamer provided open flames using propane as source of combustion. The flamer had 4 burners located 7in.high from the soil surface and were angled at 30° to the soil. Flaming treatments were applied using a constant speed of 4 mph. Varying propane pressures included: 0, 10, 30, 50, 70 and 90 psi, respectively. The propane rates applied were 0, 4, 7, 11, 15 and 19 gal/a. Plant response to flaming varied depending on the species and growth stage.

Broad-leaf weeds were very susceptible to flaming, propane rates of 11 - 15 gal/a were enough to obtain 90% control. Grasses were more tolerant than broad-leaf weeds. Propane rates of 19 gal/a and above were necessary to get 90% control in grasses. Grasses at early stages maintain their growing points below ground for this reason they are able to re-grow after flaming.

Maize and sorghum were less susceptible at the very early stages (V2), 11 gal/a of propane produced about 20% damage. On the contrary, less than 7 gal/a was enough to produce 20% damage in soybean, alfalfa, red clover and sunflower. On 2008, we started a series of experiment to determine propane tolerance on 4 crops: wheat, corn, soybean and sorghum. The effect of propane flaming on crop yield and yield components were taken into account. Data from crop response to flaming are being analyzed and will be published soon. Our next step would be to find options to flame weeds causing the lowest crop damage. Propane flaming is not an individual practice for weed control, however, it has potential to be used widely in organic agriculture.

For more information contact:
Santiago Ulloa C.
E-mail: smulloa@bigred.unl.edu
Office phone: 402.584.3810
Northeast Research and Extension Center
Haskell Agriculture Laboratory
57905 866 Road
Concord, NE 68728-2828