

WEED FLAMING: AN ENGINEERING APPROACH. Chris A. Bruening and George Gogos, Santiago Ulloa and Stevan Knezevic, Graduate student and Professor, Department of Mechanical Engineering, University of Nebraska, Lincoln, NE 68588, Graduate Student and Associate Professor, Haskell Ag Lab, University of Nebraska, Concord, NE 68728.

Weed flaming is a thermal weed control technique which has been proven to be very effective in several crops. Propane is the typical fuel source and its combustion in presence of air can produce flame and gas temperatures approaching 2000°C. These high temperatures are behind the principle of weed flaming, which is to boil the water in the plant cells, resulting in cell wall leakage and fatal damage to the targeted weed. From an engineering viewpoint, heat must be carefully controlled to maximize its effectiveness and to guarantee only weeds are being killed during flaming treatment. We have developed an improved heat control method that yielded in a higher quality treatment. Through the use of computational fluid dynamics and experimental measurements, a hood/torch device has been designed and compared to an open flame torch currently on the market. Both temperature measurements and field testing have been conducted in the comparison. Temperature measurements showed that the hood/torch device concentrated the heat of combustion, producing a larger high temperature core than the open torch. This also resulted in a longer exposure time to high temperature gases. Results from field tests showed the hood/torch device has the potential to reduce the propane consumption rate by 30-50% and to provide much greater control of flames in windy field conditions.