

COMPARISON OF THREE WEED CONTROL METHODS: CHEMICAL, FLAME AND HOT WATER.

M. Hewitt, K. Bullen and D. George.

University of Queensland, Gatton College, Lawes, Qld. 4345.

Abstract

Two forms of thermal weed control, 'flaming' and hot water application, were compared with the herbicide glyphosate on the basis of efficacy of weed kill. Hot water was equally as effective as glyphosate. Flaming was not as effective, however, acceptable weed kill was obtained on juvenile weeds. Thermal weed control achieved a good to very good rate of weed kill provided a second application followed the initial treatment in situations that benefit control with thermal methods.

Key words: Weed control efficacy, thermal, hot water, flaming, glyphosate.

Public attitudes towards chemical usage for weed control and the evidence of resistances exhibited by some plants/weeds have prompted new investigations into the use of heat application for controlling weeds.

The principle of thermal treatment is to target the plant for short periods, less than 1 second, with intense temperatures at, or greater than, 100°C. Thermal weed control destroys plant cellular material, coagulating plant proteins, thus disabling respiration and normal plant functioning.

Three methods of weed control: chemical; flame; and, hot water treatment, were compared for efficacy of weed kill. The experiments were conducted on a surrogate oat crop and a weed infested pasture in May 1997 at the Gatton College Horticultural Field Section.

An Aquatech unit, with handheld spraydeck was used for the application of hot water, whilst a Jet4 flamer (LPG fired), also hand operated, was used for flame application. Initial and repeat applications of the thermal treatments occurred, 20 May and 10 June respectively. A repeat application of glyphosate was not necessary. The efficacy of kill was visually rated using a percentage scale for efficacy and phytotoxic effect (1). Glyphosate solution (1:25) was applied at 3L/plot. LPG consumption was measured at 125 kg/Ha and water consumption averaged 410 L/plot. Control plots were used as a reference for the visual rating. Plot size was 30 m².

There is a lack of scientific literature on hot water treatment for weed control due to its brief history. Whilst considerable experimentation has occurred with flame cultivation (2), comparative studies such as this, do not appear to have been conducted or, at least, published.

Results

Observations were made over a period of 8 weeks. Very good to excellent efficacy rates were evident in Aquatech treatments, (Fig. 1), with slight decreases in time from re-shooting and regrowth of weeds.

Jet4 results showed a striking effect on weed kill following a second application. Efficacy rates in the weedy pasture were high after the second treatment with minor reductions due to re-shooting and regrowth in time. A 60% efficacy rate was recorded at 8 weeks after two applications, whereas the equivalent single application was barely observable. Jet4 performance in the oats rated from poor to fair by comparison, with low efficacy rates and decreasing efficacy with time lapse from application, (Fig. 2).

Glyphosate proved to be highly effective. Glyphosate action was slow compared to the alternatives. Careful consideration is necessary when comparing the three methods due to variations in application rates and inputs. Effective comparison between the treatments is possible provided consideration of the high application rates of glyphosate is heeded.

Plots receiving two thermal treatments had significantly less regrowth and weed infestation when compared with a single application treatment. Reapplication of both Aquatech? and Jet4? markedly increased the efficacy. The decline in efficacy for Jet4? is attributed to plant recovery which is more evident in the oats trial due to the higher resistance of established (non-juvenile) monocots to heat/fire.

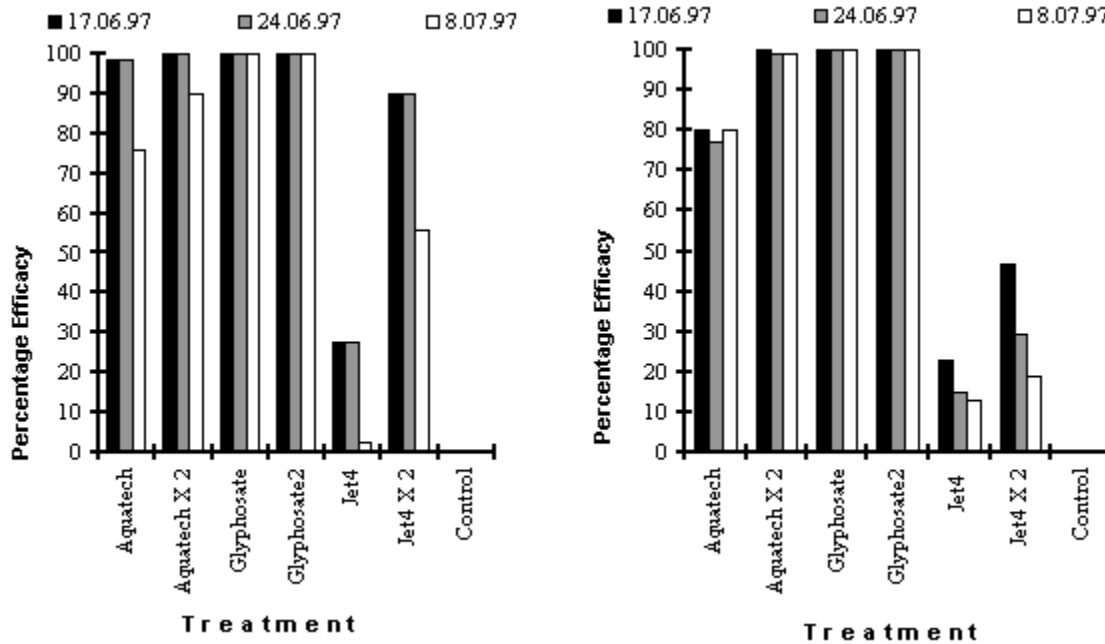


Figure 1: Percentage efficacy of treatment applications in the weed infested pasture trial.

Aquatech? was highly effective and repeat applications increased this efficacy. Jet4? weed control was effective following two applications in shorter less dense foliage. The tall dense foliage of the 8 week oat crop was more resistant to the flaming treatment than that of the weedy pasture. Targeting juvenile plants produces a far greater efficacy due to plants having a much higher susceptibility to the intense heat (L. Laimer, *pers. comm*). Further testing and investigation into the efficacy of the non-chemical alternatives is required to determine their effectiveness in different situations.

Conclusions

Thermal weed control is most effective when two sequential applications occur 3-4 weeks apart. Repeat applications of thermal methods markedly increase the efficacy of weed kill. This effect was more evident for Jet4? applications than for Aquatech? weed control. Both alternative measures proved to be effective methods of controlling weeds in situations amenable to hand held spot weeding, Aquatech? being the most effective.

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