**Weed control with herbicide applied by roller**

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**Introduction**

Living, as we do, under the curse of weeds that compete with our crops, it is no surprise that weed control is a big challenge to Conservation Agriculture.

Large scale and well informed farmers have an arsenal of herbicides coupled with sophisticated spraying equipment, as well as GMO crop varieties, to give some sense of victory over weeds. (Even this victory comes with a cost; environmental cost, financial cost, and build up of herbicide resistance in weeds)

Subsistence crop growers can weed by hand but extra work, especially required during the initiation of CA, compared with weed control in tilled soil is often a disincentive to a wider adoption of CA and a constraint to increased productivity.

Small scale commercial crop producers need alternative methods and management systems to control weed growth. Up to the present time, due to a number of constraints and errors attributable to inexperience, cover crops have not always proved sufficiently effective to deter weed growth in our trials.

For row crops, a possible solution is use of a roller to apply herbicide between growing crop plants. A roller which has its surface wetted with herbicide solution is used to touch the leaves of growing weeds. The idea is a development of wick applicators, such as the Zamwipe which is used to brush leaf surfaces with herbicide. There are also rollers used for applying herbicides in different applications. The rollers described are very much prototypes. Herbicide application rates have not been refined. Although the technology is not thoroughly researched, I believe that the concept is worth further development. The aim in making this report is to encourage other supporters of CA to consider rollers as one of the tools that crop growers can use to control weeds. Readers who are better placed to develop and test this technology can use these or similar systems to improve the practice of CA.

**Inter row herbicide roller**

Rollers have been made of 200 mm diameter PVC pipe. The size was chosen because it looked right and there happened to be some pipe that size in the university scrap yard. Metering of herbicide solution has been by drip irrigation button emitters fed by gravity from a container mounted on the handle. 8 litres per hour emitters seemed to work best with the low pressure. Wrapping the roller with polypropylene baling twine, heavy duty carpet or various foams was tried in order to get an even spread of liquid over the roller. These coverings were quite effective but were soon damaged in use.

A second roller of 50 mm diameter covered with a10 mm thick open cell foam was added to spread the liquid on to a bare plastic main roller. The drippers are mounted above the small roller so that they drip on to its surface. This arrangement is more durable and provides a good spread of liquid using lower liquid flow rate then a single roller.

A problem experienced with all rollers has been the accumulation of soil on the roller surface from touching the soil in patches of sparse mulch cover and/or from touching worm casts. After a few years of CA there has been an explosion of earth worms in our CA plots and they build casts up to about 30 mm high. Because soil reduces the effectiveness of Glyphosate the usefulness of the rollers in this case was questionable. Discs with a radius 25 mm greater than the roller radius have been added on each end to hold the roller above the soil while allowing it to contact the weed leaves. This modification has made the roller a workable and practical tool.

The width of the roller depends on the crop row spacing. Row spacing is often variable in small scale cropping situations. To accommodate this it is best that the width of the roller is half, or just over half, the intended row spacing and to do 2 passes per row.



*Figure 1:* 300 mm wide inter row herbicide roller with foam covered spreader roller, 3 x8 L/h emitters and discs to maintain height of 25 mm above surface

**Test results**

A 300 mm wide roller with three drip emitters was tested in maize 68 days after planting. The area had been rolled with a knife roller and sprayed with 4 litres/ha of Glyphosate 30 days before planting with Round Up ready maize. A further application of Glyphosate was made 11 days after planting. No other herbicide was used. At the time of the test broadleaf weeds with some grass had grown to an average height of 350 mm.

Glyphosate 360 SL (360 g/litre) was applied using the roller. Two trips were made in each row. The average walking speed included some detours to roll the weeds in gaps in the maize rows. Pushing the roller required very little effort. It is much easier than using a knapsack sprayer.

Application details

% concentration of Glyphosate 360 SL in water 3%

Application rate of Glyphosate on the treated area 3.6 litres/ha

Application rate of solution on the treated area 120 litres/ha

Average velocity during application 0.8 m/s or 2.9 km/h

Rate of work allowing for 25% time to refill 0.1 ha/h

During the test it was observed that one of the emitters was partially blocked. A test of drip rates of the emitters yielded the following results:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Level of water in container | Number of drops per 10 seconds | | | Height head from drippers to water level (cm) |
| Emitter 1 | Emitter 2 | Emitter 3 |
| Full | Too fast for drips | 29.7 | 29.3 | 70 |
| Near empty | 29.3 | 23.3 | 15.3 | 48 |
| Low flow rate as % of full flow rate |  | 79% | 52% |  |

Most of the weeds treated were dead two weeks after treatment. The difference in flow rate between emitters and between the levels in the container did not appear to make any difference.



*Figure 2:* Weeds before and after applying Glyphosate with the 30 cm roller. Weeds in the row were not treated.

The three emitters kept the roller visually very wet. It would appear that one emitter per 150 mm width of roller would be sufficient.

No filter was fitted because of the low pressure head and it is likely that blockage of drip emitters would be the result. It is proposed to use screw emitters in future. These can easily be adjusted and cleared if blocked.



*Figure 3:* Screw emitter using a 30 mm long screw in a 16 mm diameter pipe

**In row herbicide roller**

A light and small herbicide roller was made using a fluffy paint roller. The pictures in *figure 4* show the spread of dye from 4 l/h and 8 l/h emitters. As a result of the observation shown in *figure 4*, two 8 l/h emitters were used per roller. This roller can be held in one hand and pushed up to crop plants until the guard touches the plants. It is easy to get between plants along the row and kill almost all weeds without harming the crop. The original roller did not have discs on the ends to hold the roller surface above the soil. It was reasonably easy to lift it over worm casts and bare patches. Discs on the ends could be an improvement.

This roller is ideal for controlling weeds in the rows a week or two after using the large roller between the rows.



*Figure 4:* Spread of dye from a 4 litre per hour and an 8 litre per hour button emitter on a fluffy paint roller

**Further development**

It should be possible to reduce the application rate of both the solution and the herbicide product. Use of the rollers earlier in the life of the crop should replace an application of post emergence Round up. Smaller weeds would also be easier to kill than the weeds that were growing when the 300 mm wide roller was tried.

Rollers could also be used during planting, or between planting and crop emergence, to apply the initial application of herbicide only to crop rows.