APPLICATION OF HERBICIDES THROUGH SPRINKLER IRRIGATION

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The application of herbicides to alfalfa fields in California is fraught with many problems. First and foremost, alfalfa is a crop which is repeatedly harvested, and it is difficult to treat for weed control at times when the alfalfa foliage itself does not intercept much of the herbicide. Sprays and granules both tend to hang up on plant tops and crowns and fail to reach the soil where they will be most effective in controlling weeds. Large amounts of irrigation water applied over the long growing season dilute and leach winter-applied herbicides so they are not as effective as desired during the summer months. Rapid regrowth of the alfalfa after each cutting and the short span between forage removal and the next harvest makes herbicide application difficult and increases the likelihood of residue problems in the forage.

Water-run of herbicides has been relatively successful. The difficulties here lie in controlling field runoff, coverage of borders and high spots in the field, and uniformity of application throughout the water run. How about sprinkler irrigation to apply herbicides then?

The potential advantage of application of herbicides through the sprinkler irrigation system is greatest, as a time saver. Once calibration of the system is achieved, attaching an herbicide tank to the sprinkler system becomes a simple matter. Monitoring the system during an application period is easy. Such a system eliminates the need for spray rig wheel tracks in the field; reduces application costs; would provide herbicide coverage wherever the water goes, even on high spots; and the herbicide should reach the soil if an adequate time of water run after herbicide application is made to wash the herbicide off the alfalfa tops and crowns.

Some of the basic requirements which must be met to permit an herbicide to be applied through the sprinkler system, automatically eliminate most alfalfa herbicides. First, the herbicide must be registered for application in this manner. Secondly, the herbicide should have at least a 2 X safety margin on the alfalfa, otherwise due to irregular irrigation patterns herbicide injury could occur. There should be no wind to distort sprinkler patterns during the herbicide application. There must not be any leaks along any of the distribution and sprinkler lines or at the pump. Sprinkler heads should have a uniform output and must rotate freely. Overpressure and blow-outs of the system must be avoided.

Other problems that should be mentioned with sprinkler irrigation of herbicides are directly associated with water application. Field margins receive only half the water, also herbicide, that the rest of the field gets. Also, proximity of field margins to other fields, ditches, etc., may be a problem in herbicide application through sprinklers. Researchers working on this method of chemical application have observed a "layering" effect of chemical within the lines from the point of injection. This "layering" can only be broken up and the herbicide uniformly mixed in the system by installing baffels into the line, or by injecting a considerable distance away from the first lateral or by a series of bends in the system between the first lateral and the point of injection.

One problem that we encountered in a system is the differential rate of revolution of the sprinkler heads. Ten nozzles were observed, and the time recorded for a complete 360° revolution of each head. The results follow:

Nozzle Number	First Time	Second Time
1	56 seconds	56 seconds
2	2 minutes, 7 seconds	2 minutes, 7 seconds
3	1 minute, 13 seconds	1 minute, 10 seconds
4	2 minutes, 27 seconds	2 minutes, 27 seconds
5	1 minute, 10 seconds	1 minute, 10 seconds
6	57 seconds	54 seconds
7	52 seconds	50 seconds
8	3 minutes, 20 seconds	3 minutes, 40 seconds
9	2 minutes, 25 seconds	2 minutes, 25 seconds
10	33 seconds	33 seconds

It is obvious from these data that the rate-of-turn of sprinkler heads, thought to be relatively uniform, can vary as much as from 109 revolutions per hour to as few as 16 revolutions per hour. Thus, in order to achieve an acceptable distribution of herbicides, the time of injection must be long enough to permit enough revolutions of the slowest-turning heads to achieve an acceptable distribution. A problem here then, is finding a portion of the overall irrigation period when there is no wind to upset uniformity of distribution.

Several types of injection devices are available. Those which distribute or inject fertilizers into the system are too large volume devices to use for herbicides without dilution. Dilution without agitation is inadvisable since some herbicides settle out, especially wettable powders.

One of the simplest of injection systems is to use a standard sprayer which has mechanical agitation in the tank. With this system, a flow regulator is installed into the line and a pressure over-ride of 5 to 10 pounds over the sprinkler system is employed to inject into the feeder line on the suction side of the pump.

In conclusion, let me emphasize a few main points. (1) Herbicide application through sprinkler irrigation will be only as good or as uniform as your irrigation pattern. (2) Herbicides must be registered for the crop, and this method of application specified on the label for the chemical, before it can be legally applied through sprinklers. (3) Crop tolerance and registration rates must be such as to permit the variations in rates that will occur from sprinkler applications. (4) Leakage at the pump, from the main lines, from the sprinkler lines and heads, and absence of winds during application time are all essential to achieve an acceptable job.