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Chemigation-Review

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ABSTRACT

Chemigation is the use of agricultural chemicals (fertilizer, fungicides, herbicides, nematodes, soil improvement remedies, growth regulators, sewage and manure water), in an effective and economic way, by means of an irrigation system. Chemigation can be applied by means of any type of irrigation system, although some flood irrigation systems may not be apt for the application of certain types of chemicals, because of poor application uniformity. The careless use of chemicals and over-irrigation must also be prevented, because it can lead to pollution of soil and water sources.

Keywords: Chemigation, Fertilizers, Pollution, Irrigation system, Chemicals.

INTRODUCTION

Chemigation is the process of applying an agricultural chemical (pesticides or fertilizers) to the soil or plant surface with an irrigation system by injecting the chemical into the irrigation water. Chemigation can be an effective application option for some labeled pesticides if the irrigation system can apply the chemical or water solution uniformly over the target area with the correct water depth. This is one efficient way for getting rid of the pest and other insects which attacks the crops. Some pesticides work best with less than .25 inch of water per application (Burt.C.et.al. 1998).

What is Chemigation?

Chemigation is the application of pesticides or system maintenance compounds through an irrigation system. Pesticides include herbicides, insecticides, fungicides, rodenticides, fumigants, spray adjuvants, and plant growth regulators. Disinfectants, sanitizers, buffering agents, desiccants, defoliants, and sprout inhibitors are also included under the pesticide definition.

Pesticide Labels

A pesticide must be specifically labeled for chemigation to be licitly used for this purpose. Application rates that exceed the labeled rate are not only illicit, but will result in higher costs for chemicals than necessary, potentially illegal pesticide residue levels, and possible damage to the crop, irrigation system, and/or the environment. Application rates that are too low may not achieve the desired results.

CHEMIGATION SYSTEMS THAT CONTAIN MEDIA FILTERS

Some chemigators are using chemigation systems that have one or more sand-containing media filters. Surface water, and in some cases, groundwater, flows through these filters to remove debris that would clog the small orifices of the emitters on drip irrigation systems. The injection of pesticides into the irrigation line must be on

the outlet side of all media filters. This prevents pesticide from passing through the media filters and contaminating the debris, which will be released into the environment whenever the media filters are back flushed (Hanon.B. et.al. 2006).

Equipment

A variety of equipment for different methods of chemigation is available in the local trade. The choice lies with the producer on how specialized he/she wants to operate and which equipment will best suit his management style.

Choice between different types of injectors

The following factors influence the choice of injectors:

- Type of irrigation system
- Crop under cultivation
- The flow rate of system and possible flow rate changes as result of the different sizes of blocks.
- Operating pressure of and additional pressure available in the irrigation system.
- Injection rate.
- Types and quantities of the different chemicals applied.
- Concentration of the chemicals to be applied in water.
- Availability of electricity.
- Duration of operation.
- Possible future expansions.
- Safety considerations.

Injectors

Injectors can be categorized into three types, namely passive and active apparatus and a combination of the two. Passive injectors use the energy present in the irrigation system (water from the irrigation pump) or energy in the atmosphere to inject the fertilizer into the water. Active apparatus use an external energy source, e.g. electricity, to inject the fertilizer into the water at a higher pressure than the operating pressure of the irrigation system. A combination of the two types is when the energy in the pipeline is used to drive the pump, which then injects the chemicals into the pipeline. For the injection of pest control remedies, only active injectors are recommended, because of the higher accuracy of the equipment (Achorn. F.P., 1984).

Injectors can be further divided into two types, namely constant rate applicators and constant ratio applicators (proportional dividers). Constant rate applicators inject chemicals at a specific rate, irrespective of changes in flow rate.

Advantages and disadvantages

Advantages

- Well-designed and well-managed irrigation systems can apply agricultural chemicals more uniformly than an aero plane or as ground equipment.
- Chemigation can be done even if the lands are too wet for tractors or too misty for application by aero plane. Application can also be done when optimal weather conditions prevail.
- The chemicals applied, can be washed into the soil to the required depth and soil moisture can simultaneously be used for the effective functioning of certain chemicals.
- Chemigation can be applied under different soil tilling practices.
- Mechanical damage to crops is limited to the minimum with chemigation.
- Compaction of the soil by tractors is prevented by the use of chemigation.
- Chemigation reduces the operator's exposure to the chemicals.
- Chemigation reduces the danger of environmental pollution which normally accompanies water losses resulting from unfavorable weather conditions.
- Time and labour cost is reduced by using chemigation.
- Chemigation can reduce energy costs by as much as 90%.
- Chemigation can prevent leaching of especially fertiliser products beneath the root zone with accompanying pollution of subsurface water sources by applying the correct management.

Disadvantages

- Chemigation requires a high standard of management. Staff must therefore be well-trained.
- Some chemicals may be corrosive for certain irrigation equipment.
- Some additional equipment and capital outlay may be necessary for chemigation.
- Water pollution of the water source is a possibility if the correct backflow prevention valves are not installed. Safety measures must be strictly adhered to, especially where drinking water is concerned.
- Not all chemicals are suitable for chemigation.
- Chemigation requires more time than aerial spraying; therefore certain climatic factors (e.g. strong winds) can delay application.

CONCLUSION

Chemigation offers a number of benefits in terms of energy conservation. The most obvious savings occur because vehicles do not need to traverse a field to apply pesticides or fertilizers. Although chemigation poses some inherent dangers, it should be noted that proper chemigation in a micro-irrigation system has the potential of enhancing safety conditions. First, the risk of groundwater pollution and environmental contamination are reduced by virtue of its precision. Second, lesser amounts of less toxic chemicals are often applied through a system which decreases the exposure and number of individuals involved with conventional pesticide application.

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