Popular Article
ISSN:2583-7850
Trends in Agriculutre Science
Vol.2 Issue 8 August 2023, Page: 629-632

Micro-Irrigation- A Potential Tool for Weed Management

Anannya Mondal [1] Rajdeep Mohanta [2] and Shibashis Das [3]
[1] Ph.D. Scholar, Department of Agronomy, BCKV, Mohanpur, Nadia, Pin: 741252
[2] Ph.D. Scholar, Department of Fruit Science, BCKV, Mohanpur, Nadia, Pin: 741252
[3] Ph.D. Scholar, Department of Vegetable Science, BCKV, Mohanpur, Nadia, Pin: 741252
https://doi.org/10.5281/zenodo.8249504

Introduction

Since its introduction in the Fertile Crescent more than 6000 years ago, irrigation has changed agriculture and influenced society. The productivity of agricultural systems worldwide grew as a result of advances in water management, sustaining significant population expansion. During the preceding century, water use for agriculture accounted for around 90% of all water use worldwide [1] and is the cause of about 70% of all fresh water withdrawals [2]. Currently, domestic water usage in the US accounts for almost 34% (137 billion gallons/day) of water withdrawals for irrigation [3]. The amount of carbon needed to pump groundwater for irrigation is roughly 150 kg/ha [4]. In the US, irrigation is used to grow more than 65% of all vegetables and 76% of all fruit [5]. Producing the high quality and yields necessary to be viable requires irrigation of fruit and vegetable crops, which can raise marketable yields by 200% or more [6]. Howell [5] estimated that whereas irrigated lands yield around half of all crop value, they only make up 18% of the total planted area. Many farmers have a tendency to over-irrigate because they see it as an insurance policy for growing fruits and vegetables because of the significant observable increases in yield and quality connected with irrigation. In the US, irrigation can frequently account for more than 10% of input expenditures [7] and excessive irrigation can occasionally result in lower yields [8]. In addition to depleting freshwater supplies, over irrigation can cause agricultural crops to lose chemicals like fertilizers [9–11]. The effect of irrigation on weed development is a crucial part of any contemporary production system, even though irrigation systems are often built and operated with a crop of interest in mind.

Herbigation

Herbigation is the method of using irrigation water to apply herbicides to the soil. Only a portion of the area that the irrigation water wets is generally efficient at controlling weeds with herbicides. Increased herbicide absorption by weeds. Main benefit of this is accurate placement of herbicides as well as able to give to "microdose". Besides this, herbigation reduces of fertilizer, chemicals, water needed and reduce leaching of chemicals.

Impact of Surface Irrigation on Weeds

The most popular method of irrigation used globally is surface irrigation, which floods entire fields or supplies water in furrows between planted rows. Lowland rice (*Oryza sativa*) is one of the crops that is cultivated with flood irrigation most frequently all over the world. Lowland rice cultivation requires a significant amount of water because it is a semi-aquatic crop. It has been stated that rice cultivated under saturated field conditions did not incur additional water stress and produced rice in a manner similar to that of rice grown in standing water. Rice which is planted under standing water competes better with weeds than when grown in saturated soils. Although some weeds spread vegetatively, the majority grow from seeds, therefore flooding can limit germination and lessen the number of weeds that are commonly seen in rice fields. Flooded lowland rice fields have historically chosen to have semi- or aquatic weed species even if the prevalence of some weed species has decreased. Flooded soils are frequently tilled in order to lessen the occurrence of certain of these weeds. While uprooting newly germinated weed seedlings is the main objective of tillage, tilling saturated soils can damage structure and porosity sometimes.

Impact of Sprinkler Irrigation on Weeds


(Pic source-Google)

Sprinkler systems are more expensive than surface irrigation systems and need a pump to supply water at high pressures, but they offer better application uniformity and use less water to function across a variety of topographies. Sprinkler irrigation is the preferred method for spraying herbicides or other agrichemicals through the irrigation system due to enhanced application consistency. Farmers may evenly distribute water over large areas by using sprinkler irrigation, which may make it possible for some pre-emergent herbicides to be adequately integrated

In addition to using pesticides, pre-plant sprinkler irrigation of fields has been demonstrated to dramatically lessen weed pressure during the growing season when paired with shallow tillage operations after drying. "Stale seed-bedding" is another popular practice of providing water to weed seeds before planting, causing them to sprout, where they can then be handled through shallow tillage or through the application of herbicides. This practice is common among farmers in several US states.

Impact of Drip Irrigation on Weeds

While drip irrigation is often expensive and requires a lot of labor to install and administer, drip irrigation is extremely efficient with up to 95% application efficiency. Only an area close to active rooting is allowed to use fertilizers, which are conveniently delivered via drip irrigation. The target crop uses this more effectively as a result. Growers can deliver irrigation water solely to the areas necessary to grow the crop of interest with drip irrigation since it only wets the soil close to the drip line or emitter. Weed growth is slowed down by the lack of fertilizer and water in the soil between the rows. Weeds can be successfully controlled within rows when drip irrigation is used combined with plastic mulch and pre-plant soil fumigation, leaving just between- row regions to be handled.

(Pic source-Google)

Impact of Sub Surface Drip Irrigation on Weeds

For more than a century, subsurface drip irrigation (SDI) has been used in a variety of ways. The drip irrigation tubing that SDI currently utilizes has been somewhat modified for usage below ground. The walls of tubing designed specifically for multi-season SDI applications are 15 mil thick. Additionally, emitters in tubing designed mainly for SDI applications may be herbicide- impregnated to stop root penetration.

For the cultivation of high-value crops like vegetables, which have shallow root systems in general, subsurface drip irrigation may be settled at depths of 15–25 cm. For agronomic crops like cotton (*Gossypium spp*.) or maize (*Zea maize*), subsurface drip tubing is often buried 40–50 cm below the soil's surface [45]. In general, agronomic crops have deeper roots than many vegetable crops, which enables them to receive water that is placed at higher depths. Additionally, the irrigation tube while kept at deeper position lessens the possibility of substantial rat damage.

Conclusions

To create a comprehensive system for weed management in crops, irrigation management is crucial. The use of drip irrigation methods by agriculture worldwide will increase as water resources become more expensive. Although water savings may lead to the adoption of drip irrigation, its effect on weed control is remarkable. In comparison to sprinkler and surface irrigation systems, weed management will be improved by the capacity to reduce soil wetness. Furthermore, despite the increased installation costs, producers will find SDI more appealing because it precisely places water in the root zone without wetting the soil surface. Additionally, SDI is currently being used on acreages in large scale for the cultivation of cereal crops.

References

[1] Shiklomanov, IA. Appraisal and assessment of world water resources. Water International 2000; 25(1):11-32.
[2] Siebert S., Burke J., Faures JM., Frenken K., Hoogeveen J., Doll P., Portmann FT. Groundwater use for irrigation – a global inventory. Hydrology and Earth System Sciences Discussions 2010; 14:1863-1880.
[3] Hutson SS., Barber NL., Kenny JF., Linsey KS., Lumia DS., Maupin MA. Estimated use of water in the United States in 2000. Reston, Virginia: US Geological Survey; 2004.
[4] Lal R. Carbon emissions from farm operations. Environment International 2004; 30(7):981-990.
[5] Howell TA. Enhancing water use efficiency in irrigated agriculture. Agronomy Journal; 2001; 93(2):281-289.
[6] Smajstrla AG., Locascio SJ. Tensiometer – controlled, drip irrigation scheduling of tomato. Applied Engineering 1996; 12(3):315-319.
[7] Hochmuth GJ., Locascio SJ., Crocker TE., Stanley CD., Clark GA., Parsons L. Impact of microirrigation on Florida horticulture. HortTechnology 1993; 3(2):223-229.
[8] Locascio SJ., Olson SM., Rhoads FM. Water quantity and time of N and K application for trickle irrigated tomatoes. Journal of the American Society for Horticulture Science 1989; 114(2):265-268.
[9] Correll DL. The role of phosphorus in the eutrophication of receiving waters: a review. Journal of Environmental Quality 1998; 27(2):261-266.
[10] Hallberg GR. Pesticide pollution of groundwater in the humid United-States. Agriculture Ecosystems and Environment 1989; 26(3-4):299-367.
[11] Tilman D., Fargione J., Wolff B., D'Antionio C., Dobson A., Howarth R., Schindler D., Schlesinger WH., Simberloff D., Swackhamer D. Forecasting agriculturally driven global environmental change. Science 2001; 292(5515):281-2