

EFFECT OF DIFFERENT IRRIGATION METHODS ON IRRIGATION EFFICIENCY AND FODDER YIELD OF PERENNIAL LEGUME IN KANCHEEPURAM DISTRICT OF TAMIL NADU

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Abstract: Field experiment was conducted on *Desmanthus virgatus* by using different irrigation methods viz., check basin, furrow and rain gun systems at Post Graduate Research Institute in Animal Sciences, Kattupakkam during 2013-2014. Irrigation efficiencies of different irrigation methods and yield of *Desmanthus virgatus* was compared. Both the efficiencies i.e., water application and water use efficiency, were maximum in case of rain gun method of irrigation system as compared to check basin and furrow irrigation methods. Use of rain gun method of irrigation during the cropping period helped in saving water when the soil infiltration rate was very high and need of water in the root zone was less. Using rain gun irrigation system, 35% and 25 % higher water use efficiency and 17.1% and 9.0% more water application efficiency was achieved as compared to check basin and furrow irrigation method, respectively. About 3.2 % and 1.52 % more yield was obtained in rain gun irrigation system as compared to check basin and furrow irrigation methods, respectively. Therefore, it was concluded that rain gun irrigation method is the most feasible system for the production of fodder especially during water scarcity period. It reduces the manpower requirement and prevent the complication of weeds which flourish in check basin and furrow method of irrigation, thereby nutrients loss due to utilization of nutrients by the weeds arising in flood irrigation will be minimized. Water is economically and efficiently used to produce maximum biomass with minimum amount of water.

Keywords: Irrigation methods, Efficiency, fodder yield.

Introduction

Water application efficiencies at field level must be improved to overcome the shortage of water. Improvement in application efficiencies will reduce the problem of water logging. It is, therefore, important to develop techniques to use the available resources of irrigation water more efficiently during field application. Application efficiency can be increased by adopting pressurized irrigation system like rain gun irrigation, however, this system is expensive and difficult to operate by small and marginal farmers. Studies have shown that well designed and

well managed surface irrigation systems have comparable application efficiencies to those of pressurized system (Rana *et al.*, 2006). Therefore, it is important to improve surface irrigation systems and their management to increase application efficiency without lowering the biomass yield of fodder. Innovations are needed to increase the efficiency of use of available water. There are several possible approaches; one possible approach is through introducing efficient irrigation systems. Irrigation technologies and irrigation scheduling should be adopted for more effective use. This study was planned to determine the fodder yield of *Desmanthus virgatus* by using different irrigation methods and suitability of most efficient system for green fodder production.

Objectives

- (i) To determine the suitability of most efficient system for the production of leguminous green fodder *Desmanthus virgatus*
- (ii) To assess the fodder yield of *Desmanthus virgatus* under the different irrigation methods.

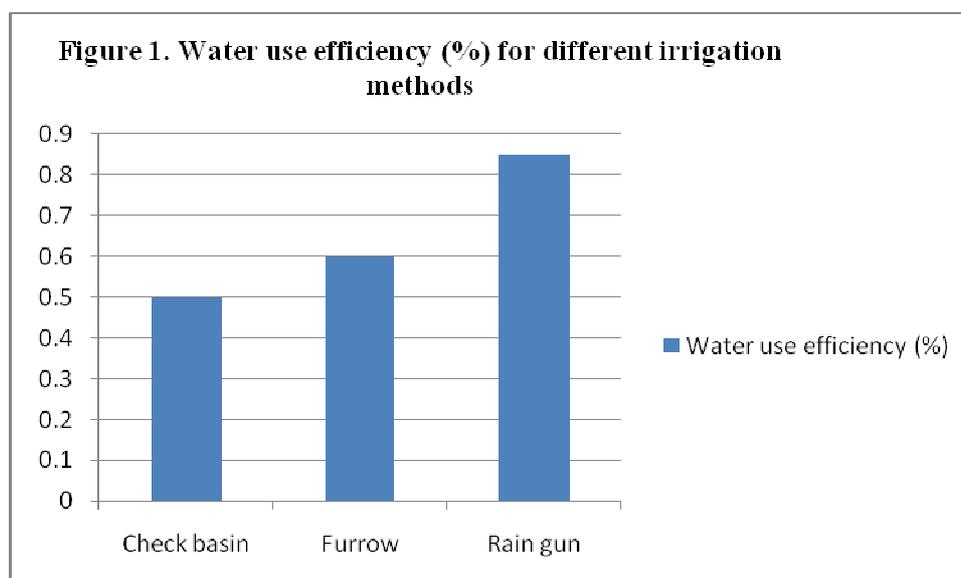
Materials and methods

The experiment was conducted at the farm area of the Post Graduate Research Institute in Animal Sciences (PGRIAS) located at Kattupakkam, Kancheepuram District of Tamil Nadu under Tamil Nadu Veterinary and Animal Sciences University, Chennai during 2013 - 2014. The type of soil in research plot was sandy loam. The total area of 0.65 hectares was divided into three portions for check basin, furrow and rain gun irrigation systems. The area for check basin and furrow was 0.20 ha each while area for rain gun irrigation system was 0.25 ha. Three replications were used for each treatment, the size of the basin was 25 m x 25 m while in furrow irrigation system each replication was consisted of 10 furrows with a length and width of 75 m and 0.75 m, respectively for each furrow. For rain gun irrigation, 50 m x 50 m plot was selected and water was applied through rain gun system. Seeds of *Desmanthus virgatus* was sown in all the irrigation systems using fertilizer rate of 10,60 and 30 kg/ha of N, P and K, respectively. The seed was sown manually maintaining row to row distance of 0.75 m and continuous sowing within row. Each irrigation was applied at 50% soil moisture deficit (Michael, 1978) using measured quantity for basin and furrow irrigations while for rain gun irrigation, the flow was measured from the storage tank for specified time interval. Gravimetric method was used for the soil moisture determination. Replicates of the treatments were placed in the experimental plot according to the randomized complete block design.

Results and Discussion

Water use efficiency

Higher water use efficiency of 27.5% was obtained by using rain gun irrigation system as compared to check basin and furrow irrigation method. The results of the water use efficiency for the check basin, furrow irrigation and rain gun irrigation are given in Figure 1. The results indicated significant differences in the three irrigation systems. Higher water use efficiency i.e. 0.85 kg/m^3 was obtained in case of rain gun irrigation system as compared to 0.6 kg/m^3 and 0.5 kg/m^3 for check basin and furrow irrigation systems, respectively. Similar findings reported by Cetin and Bilgel (2002).

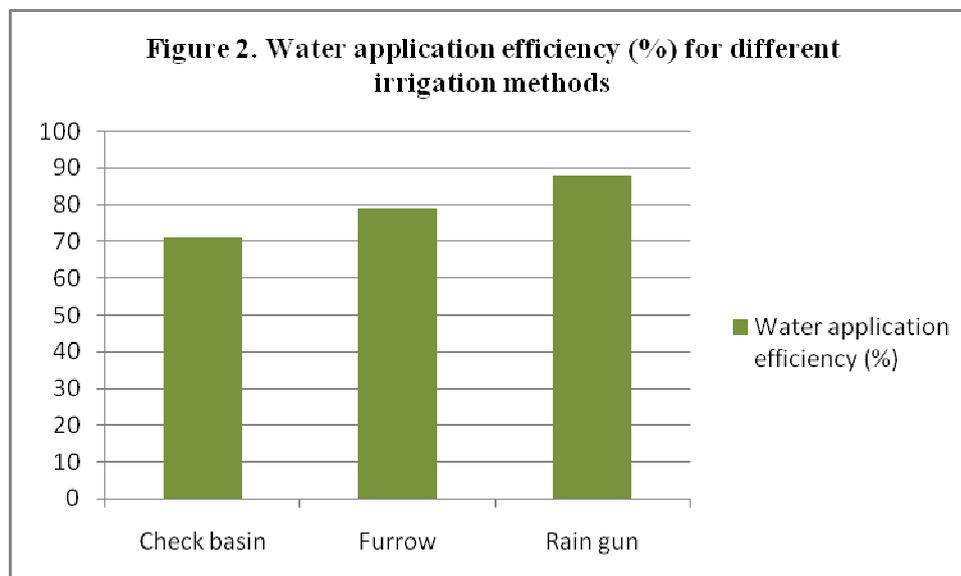


It was observed that the rain gun irrigation system used the water more efficiently as compared to other two irrigation systems. Water use efficiency in case of check basin and furrow irrigation system was nearly equal with only 0.1% difference, whereas this difference of efficiency was greater (30%) in case of rain gun irrigation system. Furthermore, the selection of rain gun irrigation system depends upon the suitability of the system to socioeconomic conditions of the farmer, his technical skills and availability of servicing facilities and spare parts. The benefit-cost ratio of the rain gun irrigation was found as 1.81, which indicated that the rain gun sprinkler irrigation system was economically feasible.

Water application efficiency

The results of the water application efficiency for the check basin, furrow irrigation and rain gun irrigation are given in Figure 2, which showed highest application efficiency of 88% in case of rain gun irrigation system. The application efficiency of furrow irrigation system was

79%. Thus, by saving 25 mm depth of irrigation and using highest application efficiency of 88%, a reasonable increase in yield was achieved by rain gun irrigation system. In addition to this, by achieving highest application efficiency of 88% under Rain gun irrigation System.



Green fodder yield:

It was observed that the green fodder yield in case of rain gun irrigation system was 3.2 % and 1.52 % higher as compared to check basin and furrow irrigation systems, respectively. It was concluded that by saving irrigation water, a reasonable increase in green fodder yield was obtained in rain gun irrigation system as compared to check basin and furrow irrigation system. Green fodder yield of 112 tonnes / ha/ year was obtained under rain gun irrigation system.

CONCLUSION

- Water application and water use efficiencies were maximum in case of rain gun irrigation system as compared to basin and furrow irrigation system. Use of rain gun irrigation during early crop season helped saving water when the soil infiltration rate was high and need of water for roots was less.
- About 35% and 25 % higher water use efficiency was achieved by using rain gun irrigation system as compared to basin and furrow irrigation system, respectively.
- About 17.1% and 9.0% more water application efficiency was observed by using rain gun irrigation system as compared to basin and furrow irrigation systems, respectively.
- In case of rain gun irrigation system, about 3.2 % and 1.52 % more grain yield was obtained as compared to basin and furrow irrigation systems, respectively.

Summary

Results revealed that well designed and well managed surface irrigation systems have comparable application efficiencies to those of pressurized system. Therefore, it is important to improve surface irrigation systems and their management to increase application efficiency without lowering the biomass yield of fodder. Study was planned to determine the fodder yield of *Desmanthus virgatus* by using different irrigation methods and suitability of most efficient system for green fodder production. Use of rain gun method of irrigation during the cropping period helped in saving water when the soil infiltration rate was very high and need of water in the root zone was less. Therefore, it was concluded that rain gun irrigation method is the most feasible system for the production of fodder especially during water scarcity period. It reduces the manpower requirement and prevent the complication of weeds which flourish in check basin and furrow method of irrigation, thereby nutrients loss due to utilization of nutrients by the weeds arising in flood irrigation will be minimized. Water is economically and efficiently used to produce maximum biomass with minimum amount of water.

References

- [1] Cetin, O. and L. Bilgel (2002). Effects of different irrigation methods on shedding and yield of cotton. *Agric. Water management*. 54: 1-15.
- [2] Michael, A.M. 1978. *Irrigation theory and Practice*, Vikas publishing House (pvt) Ltd. 576, Masjid Road, Jang pura, New Delhi.
- [3] Rana, M.A., M. Arshad and J. Masud.2006 Effect of basin, furrow and rain gun sprinkler irrigation systems on irrigation efficiencies, Nitrate Nitrogen leaching and yield of Sunflower. *Pakistan J. of Water Resources*, Vol. 10(1), January – June.