INTERNATIONAL CONFERENCE PROCEEDINGS
UNIVERSITAS ISLAM BALITAR BLITAR
Empowering Education and Society through Digital Transformation
Volume 1 (2025)

Venturimeter Booster Design in Irrigation Fertigation System Drops

Tri Handayani[1]*, Titik Irawati [2], Tarwa Mustopa [3]

Islamic University of Kadiri

Keywords:
emitter; fertigation; solution; nutrient; venturimeter

***Correspondence Address:**
trihandayani@uniska-kediri.ac.id

Abstract: The use of a venturimeter in a drip irrigation fertigation system is highly beneficial in plant cultivation. Mixing nutrients directly with water enhances absorption efficiency. However, fertigation systems often face emitter clogging due to incomplete flow of chemical solutions through pipes, causing crusting and blockages. Implementing a venturimeter helps ensure solution homogeneity and even nutrient distribution, reducing clogging risks and improving system performance. An appropriate venturimeter also simplifies maintenance, ensuring smooth and precise fertigation according to plant needs. This study used tools such as grinders, hand drills, HDPE hoses (1 inch and 5 mm), emitters, drip sticks, manometers, filters, venturimeters, flow controllers, water pumps, and NPK sensors. Materials included PVC pipes, connectors, nutrient containers, polyethylene hoses, valves, adhesives, red chili seeds, mulch, NPK, KNO_3, SP36, manure, humic acid, and trichoderma. Results showed that the highest average venturimeter discharge occurred at valve opening 4, with 695 ml/min, and the highest pressure was 1.7 bar. The highest solubility level, 590 ppm, was also achieved at valve opening 4. These findings indicate that larger valve openings increase both discharge and nutrient solubility levels, optimizing fertigation performance.

INTRODUCTION

The use of venturimeters in drip irrigation fertigation systems is very important helps in the plant cultivation process. Besides being effective and more efficient providing nutrients to plants directly mixed with water media will facilitate the absorption of these nutrients. Fertilization in drip irrigation systems has a problem, namely frequent blockages or crust on the emitter, This is caused by the chemical solution not flowing completely through the pipe series. Chemical nutrient solutions that are not flowing smoothly can easily cause blockages emitter. The sedimentation of the nutrient solution is caused by the presence of microorganism sediment, algae or calcium at the bottom of the container/tank. So a solution needs to be found in mixing nutrients. The use of a venturimeter in a drip irrigation system can be a solution to overcome the problem of blockage in

the emitter, because the nutrients are mixed when water flows at the venturimeter output. Use of venturimeters in fertigation systems or fertilization in irrigation systems drops are expected to help the homogeneity of the solution and the distribution of nutrients. completely and does not remain in the hose, thus reducing the risk of solution blockage chemical on the emitter. Using a suitable venturimeter will make it easier in maintaining a series of drip irrigation systems so that fertigation runs smoothly and precision according to plant needs. The aim of this research is to determine the size of the venturimeter opening that is effective and efficient in fertigation drip irrigation system. the use

RESEARCH METHODS

This research was conducted at the Agricultural Greenhouse in the Village Ngadiluwih, Kediri Regency. The tools used in this study including grinder, hand drill, nipple, 1 inch HDPE hose, emitter hose, drip stick, sandpaper, meter, manometer, 1 inch filter, 1 inch venturi meter, scissors, glass measuring, drill bit, nails, 10 bar *pressure gauge , flow controller ,* sandpaper, saw manual, water pump. The materials used in this study are pipes 1 inch PVC, T pipe connection, L pipe connection, nutrient solution container, polyethylene (PE) plastic hose, pipe glue, faucet stop, wooden battens, wooden rafters, PVC glue, red chili seeds, mulch, NPK, KNO3, SP36, manure, humic acid, trichoderma. This research is an experimental study with treatment venturimeter valve which consists of 4 treatments including, 1,2,3,4. Repetition was carried out 7 times. Data analysis used the variance analysis method with observation variables consist of venturimeter suction discharge, venturimeter pressure, nutrient solubility.

RESULTS AND DISCUSSION

The results of preliminary testing obtained an average venturimeter discharge The largest is at opening 4 with an average of 695 ml/minute. The average pressure The largest venturimeter at openings 3 and 4 is 1.7. The solubility level of the venturi at the input, namely a uniform 750ppm and the

highest output results at aperture 4 with an average solubility level of 590ppm. The test results for each observations are shown in Table 1.

Table 1. Average Venturimeter Test Results

	Venturi (ml/min)	Pventuri	Venturi Solubility	
			input	output
Aperture 1	580	1.2	750	550
Aperture 2	630	1.5	750	570
Aperture 3	660	1.7	750	585
Aperture 4	695	1.7	750	590

The results of the observations show that the discharge of each opening The venturimeter increases as the tap opening increases. This is in line with the increasing pressure on the venturimeter. Solubility Venturimeter also provides an image of the increasing value in line with the tap opening is getting wider. This shows that the nutrients mixed with water, the larger the tap opening, the more solution will enter big too. This is illustrated in Figure 1 below.

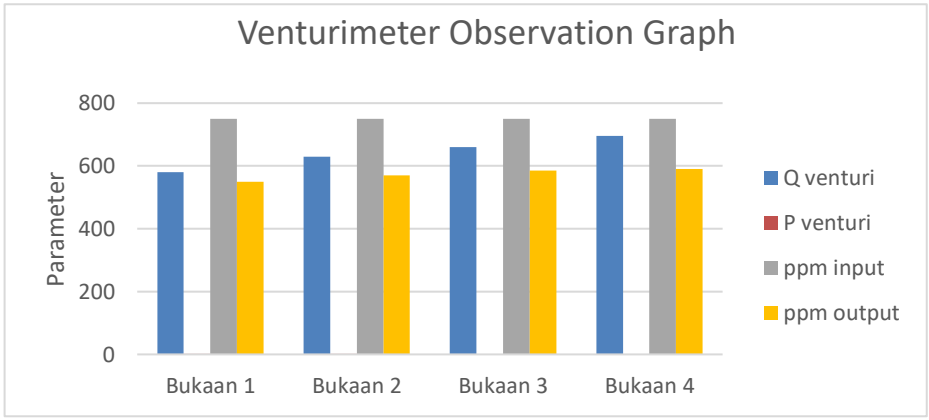

Figure 1. Venturimeter observation graph

CONCLUSIONS AND RECOMMENDATIONS

The research results show that the average ventrumeter discharge is the largest at tap opening 4 with an average of 695 ml/minute. The average pressure largest venturimeter at the 4th valve opening is 1.7 bar. The output solubility level the highest average result was obtained at tap opening 4 with a value of 590ppm. The larger the tap opening, the greater the flow rate and flow rate. solubility of nutrients.

REFERENCES

As'ri, CJ 2021. Design and Construction of an Automatic Irrigation System and Monitoring in Internet of Things-Based Agricultural Land. Surakarta University Muhammadiyah Surakarta.

Center for Agricultural Mechanization Development. 2012. Fertilizer Mixing Machine Irrigation (Fertigation) for Vegetable Plants, Indonesian Patent, ID-P0031485 B, August 3, 2025.

Handayani, T., Irawati, T. 2022. Efficiency of Drip Irrigation *System* On Japonica Melon Plants. AGROS Agricultural Journal. Vol. 24 (1): 337-341.

Handayani, T. 2023. Comparison of Drip Irrigation System Management in Plants Melon and Chili. Journal of Agribusiness. Vol. 23 (2): 137-140.

Handayani, T., Irawati, T., Mustopa, T., Utomo, PS, 2025. Design and Construction Use of a Fertigation Venturimeter in Drip Irrigation. AGRINECA Journal. Vol. 25 (1): 39-44.

Omary, R., Li, H., Tang, P., Issaka, Z., Chao, C., 2020. Review of Venturi Injector Application Technology for Efficient Fertigation in Irrigation Systems. *International Journal of Current Microbiology and Applied Sciences.* Vol.9 (1): 46-61.

Saputri, SD 2009. Design and Construction of a Microcontroller-Based Venturimeter.Depok. University of Indonesia.

Sudarja. 2002. Basic Fluid Mechanics. Yogyakarta. Muhammadiyah University Yogyakarta.