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Optimizing Red Onion TSS (True Shallod Seed) Production in the Lowlands Based on Smart Sensors

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Abstract*—Onion cultivation technology using seeds still needs to be developed and socialized at the farm level. to be socialized at the farmer level, considering that until now farmers still cultivate shallots with consumption seed bulbs because there are still not many TSS produced, especially in the lowlands.In principle, not all shallot varieties are capable of flowering, some shallot varieties are capable of flowering. flowering, some shallot varieties are only 30% capable of flowering. This problem can be solved by optimizing flowering with an automation system. The advancement of Internet of thing (IoT) technology can be applied to optimize flowering by using smart sensors on the onion. flowering by using smart sensors on several varieties of shallots. The lanchor blue variety had no flower bulbs that set fruit and produced TSS seeds. This is because all the flower bulbs of the lanchor blue variety were rotten/damaged by disease due to the use of high watering during the growth period that led to flowering, fertilization, and sprouting. There was no interaction between varieties and application of gibberellic acid + and packlobutrazol on seed yield of TSS (Table4). In Bauji and Maaserati varieties, the percentage of flower bulbs that bear fruit and seed (harvested) is still better than BiruLanchor, only about 59.68 to 70% of the total number of flower bulbs that grow (Table 4). This indicates that the process of fertilization and seed formation of shallots is not optimal.

Keywords*— Shallot; Smart Sensor Variety; True Shallot Seed. growth regulators Introduction

I. INTRODUCTION

The use of seedlings from consumption tubers is carried out for generations over a long period of time. As a result, the seed tubers used have low quality, because the seeds have been infected by many viruses and pests {2,4} One alternative that can be developed to improve the quality of shallot seedlings is TSS. (True Shallot Seed) Research on the use of botanical seeds for shallot cultivation has been carried out, but the results have not been widely applied at the farmer level, this is due to the constraints faced in producing TSS seeds. the obstacles faced in producing TSS seeds are still difficult to strive for flowering and fertilization of shallots and the percentage of seeds produced. At In principle, shallots are able to flower only 30% {3} in the lowlands. Efforts efforts to increase flowering in the highlands have been made to obtain 80-100% germination rate. especially the Bauji variety {7} but the growth vigor is still very low, because no technology has yet been optimized flowering technology and shallot cultivation technology from botanical seeds in the lowlands. shallots from botanical seeds in the lowlands. This is supported by the results of research {2} on efforts to to increase the flowering and spawning of shallots of the Bauji variety in the highlands, the results were shallots are able to flower 100% with 80-100% viability, low temperature - < 30oC and light intensity.< 30oC and high light intensity. The light intensity required is around 16 - 18 hours.18 hours, this technology is very difficult for farmers to do, therefore with the advancement ofInternet of things (IoT) technology based on smart sensors needs to be developed. To optimize flowering in the lowlands using a smart sensor system, where sensors are a very important component. is a very important component. {6} Nowadays, most types of sensors are already smart at detect and calculate certain conditions. Sensor components such as, detector elements and electronics module have been designed to be integrated on the same chip. The integration of electronic circuits Onion cultivation technology using seeds still needs to be developed and socialized at the farm level. to be socialized at the farmer level, considering that until now farmers still cultivate shallots with consumption seed bulbs because there are still not many TSS produced, especially in the lowlands. In principle, not all shallot varieties are capable of flowering, some shallot varieties are capable of flowering. flowering, some shallot varieties are only 30% capable of flowering. This problem can be solved by optimizing flowering with an automation system. The advancement of Internet of thing (IoT) technology can be applied to optimize flowering by using smart sensors on the onion. flowering by using smart sensors on several shallot varieties so that they can produce TSS. so that they are able to produce TSS. The utilization of this sensor in agriculture has been developed in Indonesia. Instrument or measuring instrument, sensor is a very important component. Nowadays, most types of sensors are already smart in detecting and calculating certain conditions. calculate certain conditions.{7} For this reason, flowering and seed formation techniques are needed for shallots to produce TSS. In addition, onion cultivation technology by using seeds (TSS) as planting material. in the highlands showed that the local Bauji variety of shallot in Nganjuk was able to increase flowering and produce fertile TSS with the addition of lighting in the temperature <30oC. Some shallot varieties that have the ability to produce TSS currently are TUK-TUK, lokananta varieties. Shallot varieties that have the potential as source of TSS seeds are Bima Brebes, Katumi, Sembrani, and Trisula TUK TUK, Lokananta, Bauji.Highland TSS production technology with environmental engineering, vernalization and GA3 treatment. vernalization and GA3 treatment can increase flowering and produce seeds.TSS This study aims to determine the success of TSS production in the lowlands and to obtain seed planting technology for growth and seed production. and to obtain seed planting technology on the growth and yield of shallot bulbs directly planted in the lowlands. The application of this smart sensor in modern agriculture is aimed at increasing TSS production in the lowlands.modern agriculture, aimed at increasing the production of TSS as planting material {10

II. METHOD

The research is planned to be implemented from April 2023 to October 2025. The tools used include lighting, temperature, humidity for shallot flowering using an android-based Arduino Uno microcontroller in the experimental garden of the Faculty of Agricultural Engineering, Computer Networks, The research time was conducted in the 2023/2025 academic year. Then polybags, cool storage, electric germinators The materials used are shallot seeds, biro lanchor, puncak and Batu Ijo, fertilizer, soil Research Design The research is planned to be carried out in two stages (2 years). The first year is carried out from bulb to seed by engineering the environment using smart sensors with the aim of increasing shallot flowering in the lowlands and obtaining data on the percentage of flowering and seeding of shallots TSS due to treatment of growth regulators and several varieties of shallots. The research was conducted in the field with smart sensors on the use of light, temperature and humidity and watering on the treatment of 2-factor growth regulators, namely Packlobutrazol and GA3 and three varieties of shallots that were able to flower 30% (Rubaru, Biro Lanchor, Super Philip), flowering age, observation of flower percentage, percentage of flowers that became seeds, number of seeds, Weight of 100 grains, growth power. The second year was carried out for the production of bulbs from TSS (Seed to Bulb) The effect of silica administration and transplanting techniques was the percentage of the success rate of seed vigor (growth power), with the aim of obtaining information on bulb production originating from TSS seed planting carried out in the lowlands based on smart sensors (smart sensors). The data obtained were then analyzed using Anova analysis of variance in (Table 1) (12). After completing the Anova randomized block design (RAK), a test was then carried out to determine the effect of the treatment. If there is a significant difference, then it is carried out

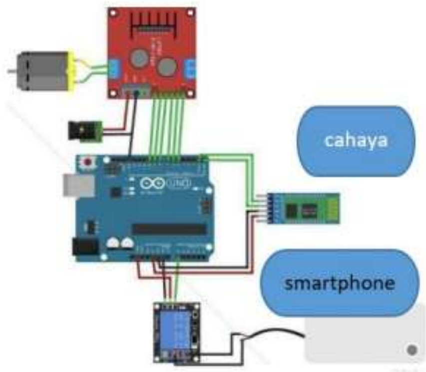


Figure 1. System control

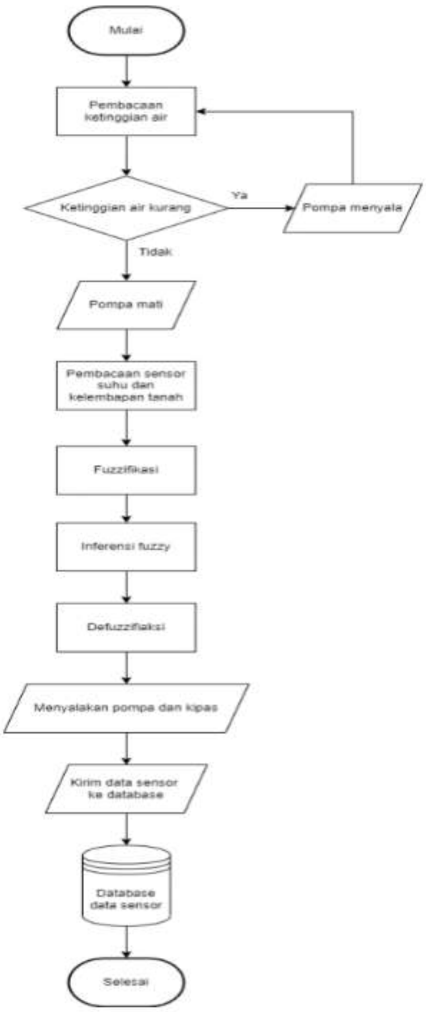


Fig. 1 Research Design

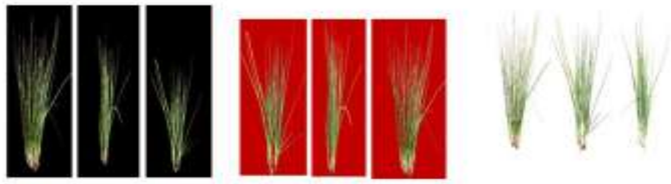
III. Result and Discussion

The results of the analysis showed that the administration of GA3 and packlobutrazol to three varieties showed no interaction and no significant difference in plant length at all observation ages. The average plant length due to the frequency of GA3 and Packlobutrazol administration to three varieties is presented in Table 1.

Table 1. Effect of Frequency of GA3 and Packlobutrazol Administration on Plant Length in Three Varieties of Red Onion

Treatment	Day After transplasting		
	14 HST	21 HST	28 HST
V1 (Biru lanchor)	17,67	22,25	29,88
V2 (Bauji)	17,63	22,44	29,92
V3 (Maserati)	17,64	21,63	29,75
BNT 5%	tn	tn	tn
P1 (GA3)	18,45	22,84	30,37
P2 (Packlobutrazol)	16,84	21,38	29,33
BNT 5%	tn	tn	tn

The average length of the shallot plant increased at the age of 14-28 HST.he average length of the plant in the P1 treatment and the V2 variety shows that the Bauji variety in both the highlands and lowlands has increased plant growth, this can be seen in the picture below



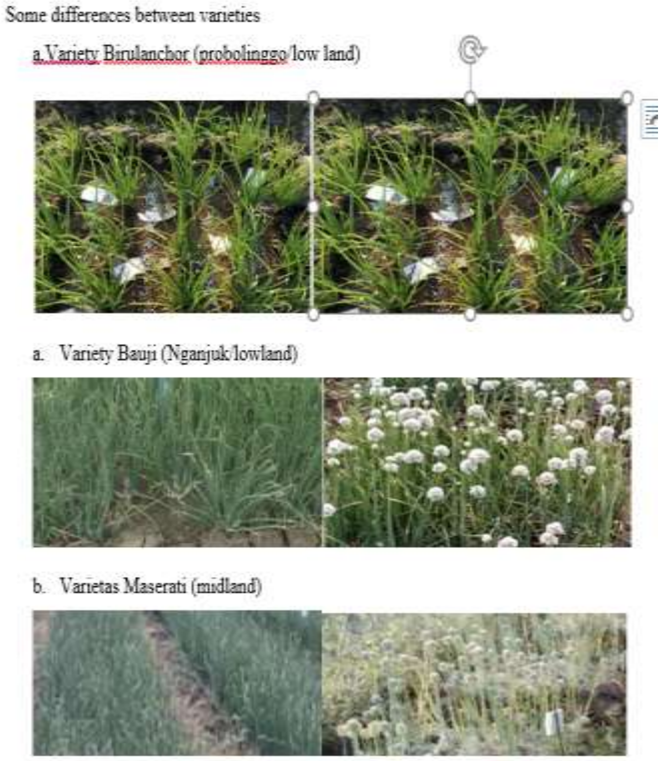
Gambar 1. Panjang Tanaman Bawang Merah Varietas Baiji   Gambar 2. Panjang Tanaman Bawang Merah Varietas Varietas Lanchor   Gambar 3. Panjang Tanaman Bawang Merah Varietas Maserati

Tabel 2. The Effect of GA3 and Packlobutrazol Administration on Flowering Age of Three Smart-Based Red Onion Varieties

treatment	Floering Age
V1 (Biru lanchor)	50
V2 (Bauji)	35
V3 (Maserati)	60
BNT 5%	tn
P1 GA3	39,33
P2 Packlobutrazol	34,00
BNT 5%	tn

Bauji variety with GA3 administration is able to accelerate the flowering age. GA3 and packlobutrazol administration is given at the right time, namely at the time of initiation, which is when the plant carries out the flower formation process by adding high salt to increase flowering by installing a sensor in Fig. 3. This sensor includes sensors to measure salt content, temperature, soil moisture, soil NPK.

Gambar 1. Umur Berbunga Tanaman Bawang Merah Varietas Bauji   Gambar 2. Umur Berbunga Tanaman Bawang Merah Varietas Lanchor   Gambar 1. Umur Berbunga Tanaman Bawang Merah Varietas Maserati



In the blue Lanchor variety, there were no flower umbels that became fruit and produced TSS seeds. This was because all flower umbels of the blue Lanchor variety rotted/were damaged by disease due to the use of quite high water during the growth period so that flowering, fruiting, and seeding. There was no interaction between the variety and the application of gibberellic acid + and packlobutrazol on the TSS seed yield (Table 4). In the Bauji and Maaserati varieties, the percentage of the number of flower umbels that bore fruit and seeds (which were harvested) was still better compared to the BiruLanchor variety, only around 59.68 to 70% of the total number of flower umbels that grew (Table 4). This shows that the fertilization and seed formation process of shallots is not optimal. According to Pooler & Simon (1993), the temperature around the plant affects the initiation of flowering and its development. For the initiation of flowering to occur, a low temperature (7–12oC) is required (Brewster 1987).

CONCLUSION

1. Interaction between varieties with GA3 and Packlobutrazol applications did not occur

2. on the percentage of the number of flowering shallot plants; The highest number of flowering shallot plants was found in the

Bauji and Maserati varieties with 54.06 – 70%;

3. The highest yield of shallot seeds (TSS) was obtained with the application of GA3 plant growth regulator

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