



Arrangement of Growing Space in Rows and Application of Liquid Organic Fertilizer to Intercropping Yields of Onions and Soybeans



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Keywords

intercropping of shallots and soybeans; liquid organic; onions; rabbit urine POC; spacing;

Abstract

The research was to obtain optimal rabbit urine POC concentrations and space to grow in rows to provide high yields for intercropping shallots and soybeans. The results showed that the interaction of rabbit urine POC concentration with the growing room and the treatment room had no significant effect (P>=0.05) on all observed variables. The highest yields of shallot bulbs per clump and per hectare were obtained at the concentration of POC rabbit urine 150 ml.l-1, namely 66.87 g and 6.69 tons, increasing 35.28% and 35.42% compared to the lowest yields at POC concentrations. 25 ml.l-1 i.e. 49.43 g and 4.94 tons. The highest yield of soybean per plant and hectare was obtained at the concentration of POC rabbit urine 150 ml.l-1, namely 32.38 g and 4.32 tons, an increase of 56.47% and 57.09% compared to the lowest yield at the concentration of POC. 25 ml.l-1 i.e. 2.75 tons and 20.63 g.

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1 Introduction

In the development of agricultural cultivation, optimization of land productivity is a priority, one of which is the intercropping pattern. Intercropping patterns are often associated with sustainable agricultural systems, where the use of fertilizers and pesticides is more efficient, reduces erosion, land conservation, soil biological stability and obtains more stability and diversity of yields than monoculture planting (Warman & Kristiana, 2018). Intercropping is a dual cropping system in which two or more different types of plants are planted simultaneously at relatively the same time by planting alternately and at regular intervals on the same plot of land. Types of intercropped plants are onion plants with soybean plants. Onions are a spiced vegetable which, although not native to Indonesia, but its use as a culinary delicacy is attached to the tongue of the Indonesian people. Almost all Indonesian dishes use onions as one of the seasonings (Wibowo, 1991). The government is re-evaluating to intensify farmers to plant crops that are the daily needs of the community. because they need for onions in Indonesia is still an important note in advancing agricultural production.

Soybean is an important source of protein in Indonesia, public awareness of the fulfillment of good nutrition is increasing both the adequacy of animal protein and vegetable protein. Animal protein, which is still expensive, has resulted in people choosing alternative vegetable proteins at low prices and affordable by the wider community. Soybean is a legume plant that can bind free N from the air because of its symbiosis with Rhizobium bacteria. The symbiosis that occurs in environmental conditions that meet growing requirements can fulfill part or even all of the N needs for plants (Purwaningsih, 2009).

To increase yields on intercropping plants, it is necessary to regulate the growth space and the availability of sufficient nutrients so that plants can grow and give good results so that competition between plants in nutrient absorption is not at a detrimental level. Nutrients can be obtained from liquid organic fertilizer (POC) from rabbit urine. Liquid organic fertilizer derived from rabbit urine has a fairly high nutrient content, namely 4% N; P2O5 2.8%; and 1.2% K2O can increase soil fertility, increase microorganism activity and increase plant productivity (Gustia, 2017). Arrangement of growing space in rows on shallot plants can minimize competition such as sunlight, nutrient absorption, and more efficient use of space. Arrangement of rows of plants and spacing can also have other positive impacts such as avoiding overlapping between plant crowns and providing space for tuber development. Research Results (Yuliantini & Kartini, 2021) the application of 15 ton.ha-1 organic fertilizer gave the highest yield of onions.

2 Materials and Methods

The research was conducted in rice fields in Tempekan Abianbase, Subak Buaji, Kesiman Village, East Denpasar District, Denpasar City starting from February to May 2021. The research method used a factorial randomized block design, consisting of two factors, namely the concentration of rabbit urine POC and growing space. Rabbit urine POC concentration (U) consists of 6 levels, namely: U1 = 25 ml.l-1; U2 = 50 ml.l-1; U3 = 75 ml.l-1; U4 = 100 ml.l-1 ; U5 = 125 ml.l-1; U6 = 150 ml.l-1 and the Growing Room (R) consists of 2 levels, namely R1 = 40x20 cm; R2 = 40x25cm. So that 12 combination treatments were obtained 3 times, so 36 experimental plots were needed. The implementation of the research included land preparation, making plots measuring 1.5x1.5 m as many as 36 plots with a mound height of 20 cm, a distance between plots of 30 cm and between replications of 50 cm; planting is carried out in the afternoon, for onion seeds before planting, cut the ends of 1/3 of the next section planted with a depth of 3 cm; for soybean seeds planted with a spacing of 40x30cm. Giving rabbit urine POC is done every week starting at the age of 14 days after planting, according to treatment. Maintenance includes watering, replanting, weeding, and controlling pests and diseases. Harvesting is done at the age of 73 days after planting. for onion and soybean plants aged 85 days after planting. , according to the harvest criteria. Variables observed in shallots and soybeans were plant height, number of leaves, number of bulbs, number of pods, the fresh yield of tubers, and dry yield of

soybeans. The data were statistically analyzed using an analysis of diversity (Amiri et al., 2021; Zhang et al., 2020).

3 Results and Discussions

The results of statistical analysis of all observed variables obtained the significance of Rabbit Urine POC Concentration (U) and Growing Space (R) and their interaction (UxR) to the observed variables are presented in Table 1. From Table 1 The interaction of rabbit urine POC concentration (U) with the growing room (UxR) and treatment with the growing room (U) had no significant effect ($P \geq 0.05$) on all observed variables. Rabbit urine POC concentration (U) had a very significant effect ($P < 0.01$) on maximum shallot plant height, the maximum number of leeks, fresh weight of tubers per clump, the yield of fresh tubers per hectare, maximum soybean plant height, number of pods containing per plant, dry weight of seed harvested per plant and yield of dry seed harvested per hectare; significant effect ($P < 0.05$) on the maximum number of soybean leaves and no significant effect ($P \geq 0.05$) on the number of tubers per clump. The average values of the variables observed in rabbit urine POC concentrations (U and growth chamber (R) and their interactions are presented in Table 2 and Table 3.

Table 1
Significance of rabbit urine POC concentration (U) and growing room (R) and their interaction (UxR) on all observed variables.

No	Variable	Treatment (U)	Interaction (U)	Interaction (UxR)
1	Maximum union plant height (cm)	**	ns	ns
2	Maximum number of union leaves (strands)	**	ns	ns
3	Number of tubers per clump (tubers)	Ns	ns	ns
4	Fresh weight of onion bulbs per clump (g)	**	ns	ns
5	Fresh tuber yield per hectare (tonnes)	**	ns	ns
6	Maximum soybean plant height (cm)	**	ns	ns
7	Number of leaves of soybean plant (strands)	*	ns	ns
8	Number of pods contained per plant (pods)	**	ns	ns
9	Harvested dry seed weight per plant (g)	**	ns	ns
10	Yield of dry seeds harvested per hectare (tonnes)	**	ns	ns

Note: ns = not significant ($P \geq 0.05$), * = significant ($P < 0.05$), ** = very significant ($P < 0.01$).

Table 2
The average value of the onion plant variables observed in the concentration of POC in rabbit urine (U) and growing space (R)

Treatment of tubers/(tonnes)	Maximum plant height. (cm)	Maximum number of leave (strand)	Number of bulbs/ clumps	Fresh weight of tubers/clump (g)	Fresh weight hectare
Rabbit Urine POC concentration (U)					
U1	20,51 e	16,67 d	7,00 a	49,43 e	4,94 e
U2	24,68 d	25,17 c	7,50 a	52,68 d	5,27 d
U3	26,67 c	26,50 c	7,67 a	55,55 c	5,65 c
U4	27,82 bc	30,17 b	7,67 a	56,48 c	5,65 c
U5	29,22 ab	30,67 b	7,83 a	59,02 b	5,90 b
U6	30,20 a	33,50 a	7,33 a	66,87 a	6,69 a

BNT 5 %	1,63		2,12		-		2,12		0,21	
Growing Space (R)										
R1	26,88	a	26,89	a	7,50	a	56,29	a	5,63	a
R2	26,65	a	27,33	a	7,50	a	57,05	a	5,71	a
BNT 5 %	-		-		-		-		-	

Table 3
The average value of soybean plant variables observed in rabbit urine POC concentrations (U)
and growing room (R)

PERLAKUAN	Maximum plant height. (cm)		Maximum number of leave (strand)		Number of pods contained per plant (pods)		Seed weight per plant (g)		Yield of seed per hectare (ton)	
Rabbit Urine POC concentration (U)										
U1	36,83	d	47,33	d	38,75	f	20,63	e	2,75	e
U2	39,43	c	47,67	d	38,75	e	23,09	d	3,08	d
U3	40,50	c	49,00	cd	47,17	d	26,11	c	3,48	c
U4	42,83	b	51,33	bc	50,75	c	28,96	b	3,86	b
U5	44,40	a	53,83	ab	53,65	b	31,31	a	4,17	a
U6	45,75	a	54,50	a	56,40	a	32,38	a	4,32	a
BNT 5 %	1,47		2,91		1,66		1,20		0,16	
Growing Space (R)										
R1	41,43	a	50,61	a	47,66	a	26,36	a	3,52	a
R2	41,90	a	50,61	a	49,24	a	27,80	a	3,71	a
BNT 5 %	-		-		-		-		-	

Note: The average value followed by the same letter in the same treatment and column is not significantly different at the 5% LSD test level.

Rabbit urine POC concentration had a very significant effect on intercropping yields of shallots and soybeans. Increasing the concentration of POC in rabbit urine will also increase crop yields. Intercropping creates a complex cropping agroecosystem, which includes interactions between different plant species. Competition/competition that occurs is not at a disadvantageous level and shows the efforts of plants to obtain the same resources (Li et al., 2001; Moghbeli et al., 2019). The highest yield of fresh tubers per hectare and dry weight of tubers per clump was obtained at the concentration of POC rabbit urine 150 ml.l-1 which was 6.69 tons and 66.87 g or increased by 35.42% and 35.28% compared to the lowest yields. obtained at a POC concentration of 25 ml.l-1, which is 4.94 tons The high yield of tubers per plant and hectare is supported by the plant height and the number of leaves of the shallot plant (Table 2).

The yield of dry seeds harvested per hectare and the highest dry weight harvested seeds per plant was obtained at the concentration of POC rabbit urine 150 ml.l-1, namely 4.32 tons and 32.38 g which were not significantly different from the POC concentration of rabbit urine 100 ml. l- 1, namely 4.17 tons and 31.31 g or an increase of 57.09% and 56.47% and 51.64% and 51.77% compared to the lowest results obtained at the concentration of POC 25 ml.l-1, namely 2.75 tons and 20.63 g. The high yield of dry seeds harvested per plant and per hectare was supported by maximum plant height, the number of leaves, and the number of pods per plant (Table 3). The high yield of shallot and soybean intercropping, namely the yield of shallot bulbs and soybean seed yields at a concentration of POC 150 ml.l-1 was due to the fermented rabbit urine containing important mineral elements, namely N, P, K, and growth regulators. Rabbit urine liquid organic fertilizer can increase the proliferation of microorganisms in the soil that actively remodel and release nutrients in the weathering process so that the decomposition process will combine loose soil grains which cause better water absorption (Souza et al., 2021; Bayoumi et al., 2019). Giving rabbit urine POC can provide nutrients to support vegetative growth and plant production and increase nutrient content and can increase plant growth and yield. This is supported by (Mutryarny et al., 2014) in his research stated that good growth and production response to rabbit urine POC was caused by the presence of nutrients in the form of nutrients contained in

rabbit urine POC. Liquid organic fertilizer of rabbit urine contains macro elements N, P, K which is quite high compared to POC of other livestock urine. This can be seen by giving the concentration of POC rabbit urine 150 ml.l-1 giving the growth of intercropping plants, namely the height of the shallot and soybean plants, the higher the number of shallots and soybeans compared to other treatments. The increasing plant height and number of leaves will cause increased photosynthesis so that the resulting photosynthate is more translocated to increase the fresh weight of tubers per clump as well as the number of filled pods per plant and dry weight of seed harvest per plant. Furthermore (Rosdiana, 2015) added that rabbit urine is a liquid organic fertilizer that contains nitrogen (N) = 2.72%, which is important for plants. The element N is needed by plants for the formation of plant vegetative parts, such as leaves, stems, and roots and plays a vital role when plants carry out photosynthesis, forming chlorophyll. The use of this liquid organic fertilizer has several advantages, including being able to quickly overcome nutrient deficiencies, not having a problem with nutrient leaching, being able to provide nutrients quickly, generally not damaging the soil and plants even though it is used as often as possible, having a binder so that the fertilizer solution is given. to the ground, the surface can be directly used by plants (Huang et al., 2020; Zhou et al., 2011).

4 Conclusion

From the research, it can be concluded

- The interaction of rabbit urine POC concentration with the growing room and the treatment room had no significant effect ($P \geq 0.05$) on all observed variables.
- The highest yield of shallot bulbs per clump and per hectare was obtained at the concentration of rabbit urine POC 150 ml.l-1, namely 66.87 g and 6.69 tonnes or increased by 35.28% and 35.42% compared to the lowest yields. obtained at a concentration of POC 25 ml.l-1, namely 49.43 g and 4.94 tons.
- The highest yield of dry soybean seeds per plant and per hectare was obtained at the concentration of POC rabbit urine 150 ml.l-1, namely 32.38 g and 4.32 tons or an increase of 56.47% and 57.09% compared to the lowest yield. at a concentration of POC 25 ml.l-1 which is 2.75 tons and 20.63 g

The suggestions put forward in this research are:

- To increase the yield of intercropping shallots and soybeans, rabbit urine POC with a concentration of 150 ml.l-1 can be given.
- Further research needs to be done on different places and combinations of treatments, for example combining solid and liquid fertilizers (Enciso et al., 2007; Knezevic et al., 2013; Sari & Sjah, 2016).

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