AGRIWAR JOURNAL
MASTER OF AGRICULTURAL SCIENCE WARMADEWA UNIVERSITY
E-ISSN: 2808-1137, **P-ISSN**: 2808-1323
Vol. 1, No. 2, Dec 2021, Page 57-62
DOI: https://doi.org/10.22225/aj.1.2.4315.57-62

Application of Rabbit Liquid Organic Fertilizer on Intercropping Yield of Onion (*Allium Ascalonium*, L.) and Soybean (*Glycine Max*, L.)

Sastra Eli Waruwu*, Made Sri Yuliartini, Luh Kartini

Agrotechnology Study Program, Faculty of Agriculture, Warmadewa University
*Corresponding author: sastra.wr03@gmail.com

Abstract
This study aims to determine the effect of rabbit Liquid Organic Fertilizer (LOF) concentration on the yield of intercropping shallots and soybeans. This research was carried out in rice fields, Tempekan Abianbase Subak Buaji, Denpasar from February to May 2021. The research method used was a simple randomized block design (RBD) with one factor treatment of rabbit LOF consisting of 6 levels, namely UC1 = 25 ml.l^{-1}, UC2 = 50 ml.l^{-1}, UC3 = 75 ml.l^{-1}, UC4 = 100 ml.l^{-1}, UC5 = 125 ml.l^{-1} and UC6 = 150 ml.l^{-1} repeated 3 times so that 18 plots are required. The highest fresh weight of tubers per clump and fresh yield of tubers per hectare was obtained at concentrations of 150 ml.l^{-1}, namely 44.50 g and 4.45 tons, increased by 14.72% and 14.69% compared to concentrations of 25 ml.l^{-1}, namely 38.79 g and 3.88 tons. The dry weight of seed harvest per plant and the highest dry yield of seed harvest per hectare was obtained at concentrations of 150 ml.l^{-1}, namely 30.02 g and 4.00 tons, increased by 28.40% and 27.39% compared to the concentration of 50 ml. l^{-1} are 23.38 g and 3.14 tons. The highest oven dry weight of seeds per plant and oven dry yield per hectare was obtained at concentrations of 150 ml.l^{-1}, namely 22.95 g and 3.06 tons, an increase of 26.86% and 26.97% compared to a concentration of 50 ml.l^{-1}are 18.09 g and 2.41 tons.

Keyword: *Rabbit liquid organic fertilizer; intercropping; shallots; soybeans.*

1. Introduction

Shallots (*Allium ascalonicum*, L.) belong to the onion tribe or Liliaceae family, monocotyledoneae class [1]. Shallots are a spiced vegetable which, although not native to Indonesia, but its use as a culinary delicacy is really attached to the tongue of the Indonesian people. Shallots when squeezed will emit a very pungent odor [2]. Almost all Indonesian dishes use onions as one of the seasonings [3]. The government must re-evaluate to intensify and encourage farmers to return to planting crops that have been a daily necessity in the community. Although it is undeniable that the need for onions in Indonesia is still an important note in advancing agricultural production, because Indonesia is famous for having fertile land and the government continues to focus on encouraging and advancing the agricultural sector with agricultural intensification.

Soybean plants generally grow upright, bush-shaped and are annuals [4]. 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. Problems in efforts to increase agricultural production, especially soybean development, include the use of uncontrolled technology packages so that environmental pollution occurs; productive agricultural land is getting narrower; monoculture farming system. Soybean is a legume plant that is able to bind free N from the air because of its symbiosis with Rhizobium bacteria. Symbiosis that occurs in environmental conditions that meet growing requirements is able to fulfill part or even all of the N needs for plants [5].

In the development of agricultural cultivation, optimization of land productivity is a priority, one of which is the intercropping pattern. Intercropping is the planting of two or more types of plants on a plot of land at the same time. 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 [6]. Intercropping is a dual cropping system in which two or more different types of plants are planted simultaneously at relatively the same or different times by planting alternately and at regular intervals on the same plot of land. Types of intercropped plants are onion plants with soybean plants.

Efforts to increase yields in plants with an intercropping system require the availability of sufficient nutrients so that plants can grow and give good results, so competition between plants in nutrient absorption is not at a detrimental level. Nutrients can be obtained from liquid organic fertilizer from rabbit urine. Liquid organic fertilizer derived from rabbit urine has a fairly high content of N, P and K elements that can increase soil fertility, increase microorganism activity and increase plant productivity [7]. The manufacture of liquid organic fertilizer cannot be separated from the role of animal and vegetable microorganisms that help in the fermentation process [8]. Currently, the use of animal and vegetable microorganism solutions as liquid organic fertilizer has developed not for rice plants but also for other agricultural crops such as vegetables, secondary crops and fruits [9]. The right combination will have a positive effect on the growth of each plant [10]. The aim of this study was to obtain optimal rabbit LOF concentrations so as to provide stability and diversity of intercropping shallots and soybeans. The hypothesis proposed in this study is that giving rabbit 100 $ml.l^{-1}$ Liquid Organic Fertilizer (LOF) can increase the growth and yield of cultivated plants.

2. Materials and Methods

This research was conducted in paddy field, Tempekan Abianbase Subak Buaji, Denpasar. The time of the study was carried out from February to May 2021. The materials used in this study were shallot plant seeds and soybean plant seeds, rabbit liquid organic fertilizer (LOF), solid organic fertilizer and basic NPK fertilizer. While the tools used are sickle, hoe, shovel, meter, gembor, bucket, ruler, scale, raffia rope, scissors, research signage and other tools that support the implementation of the research.

This study is a non-factorial experiment with a simple Randomized Block Design (RBD) basic design with one factor treatment of rabbit LOF consisting of 6 levels, namely UC_1 = 25 $ml.l^{-1}$, UC_2=50 $ml.l^{-1}$, UC_3=75 $ml.l^{-1}$, UC_4=100 $ml.l^{-1}$, UC_5=125 $ml.l^{-1}$ and UC_6=150 $ml.l^{-1}$ repeated 3 times so that 18 plots are required. The data obtained were analyzed by analysis of variance and continued with the 5% LSD test. Variables observed in shallots include: maximum plant height, maximum number of leaves, number of bulbs per clump, fresh weight of bulbs per clump, tuber fresh yield per hectare, weight fresh tubers per clump, oven dry weight of tubers per clump, oven dry weight of tubers per hectare, oven dry weight of tubers per clump, and harvest index. While the variables observed in soybean plants included: maximum plant height, maximum number of leaves, number of pods per planting hole, number of pods filled per planting hole, number of seeds per planting hole, dry weight of seeds harvested per planting hole, dry seed yield per hectare, fresh weight of fresh seeds per planting hole, oven dry weight of seeds per planting hole, dry weight harvested 100 seeds per hole sowing, oven-dry weight of 100 seeds per planting hole, oven-dry seed yield per hectare and oven-dry weight per planting hole.

3. Results and Discussion

Based on the results of statistical analysis, the significant effect of rabbit LOF concentration treatment on the variables observed in onion plants in an intercropping pattern with soybeans is presented in Table 1. The average of all observed variables is presented in Table 3.

DOI: https://doi.org/10.22225/aj.1.2.4315.57-62

Table 1. Significance of the effect of rabbit LOF concentration treatment on variables observed in onion plants in intercropping patterns with soybean plants

No	Variable	Treatment
1	Maximum plant height (cm)	**
2	Maximum number of leaves (strands)	**
3	Number of tubers per clump (tubers)	**
4	Fresh weight of tubers per clump (g)	**
5	Fresh yield of tubers per hectare (tonnes)	*
6	Fresh weight per clump (g)	*
7	Oven dry weight of tubers per clump (g)	ns
8	Oven dry yield per hectare (tonnes)	ns
9	Oven dry weight per clump (g)	ns
10	Harvest index (%)	ns

Information:
ns = no real effect ($P \geq 0.05$)
* = have a real impact ($P \leq 0.05$)
** = very real effect ($P \leq 0.01$)

The results of statistical analysis of the variables observed in soybean plants in an intercropping pattern with shallots, obtained the significant effect of treatment with rabbit LOF concentrations, which is presented in Table 2. The average of all observed variables is presented in Table 4.

Table 2. Significance of the effect of rabbit LOF concentration treatment on the variables observed in soybean plants in an intercropping pattern with onion plants

No	Variable	Treatment
1	Maximum plant height (cm)	**
2	Maximum number of leaves (strands)	**
3	Number of pods per plant (fruit)	**
4	Number of pods contained per plant (fruit)	**
5	Number of seeds per plant (seeds)	**
6	Dry weight of seed harvest per plant (g)	**
7	Dry yield of seed harvest per hectare (tonnes)	**
8	Harvest dry weight 100 seeds per plant (g)	ns
9	Fresh weight per plant (g)	*
10	Oven dry weight of seeds per plant (g)	**
11	Oven dry seed yield per hectare (tonnes)	**
12	Oven dry weight 100 seeds per plant (g)	ns
13	Oven dry weight per plant (g)	*

ns= no signifinan ($P \geq 0.05$), * = significant ($P \leq 0.05$), ** = very significant ($P \leq 0.01$)

The highest fresh weight of tubers per clump was obtained at a concentration of 150 $ml.l^{-1}$ treatment, which was 44.50 g, an increase of 14.72% compared to the treatment with a concentration of 25 $ml.l^{-1}$, which was 38.79 g. Fresh weight of tubers per clump was supported by maximum plant height, maximum number of leaves and number of tubers per clump. The highest fresh tuber yield per hectare was obtained at the concentration treatment of 150 $ml.l^{-1}$, which was 4.45 tons, an increase of 14.69% compared to the treatment with a concentration of 25 $ml.l^{-1}$, which was 3.88 tons. Fresh yield of tubers per hectare was supported by maximum plant height, maximum number of leaves, number of tubers per clump and fresh weight of tubers per clump.

The highest dry weight of seed harvest per plant was obtained at a concentration treatment of 150 $ml.l^{-1}$, which was 30.02 g, an increase of 28.40% compared to the treatment with a concentration of 50 $ml.l^{-1}$, which was 23.38 g. The dry weight of seed harvest per plant was supported by maximum plant height, maximum number of leaves, number of pods per plant, number of filled pods per plant and number of seeds per plant. The highest dry yield of seed

DOI: https://doi.org/10.22225/aj.1.2.4315.57-62

harvest per hectare was obtained at the concentration treatment of 150 ml.l^{-1}, which was 4.00 tons, an increase of 27.39% compared to the concentration treatment of 50 ml.l^{-1}, which was 3.14 tons. The dry yield of seed harvest per hectare was supported by maximum plant height, maximum number of leaves, number of pods per plant, number of filled pods per plant, number of seeds per plant and dry weight of seed harvest per plant.

Table 3. The average of all variables in the treatment of rabbit LOF concentrations on plants shallots in an intercropping pattern with soybeans

Treatment	Maximum plant height (cm)		Maximum number of leaves (strands)		Number of tubers per clump (tubers)		Fresh weight of tubers per clump (g)		Fresh yield of tubers per hectare (tonnes)	
25 ml.l^{-1}	21.92	a	20.67	a	6.00	a	38.78	a	3.88	a
50 ml.l^{-1}	23.83	b	21.33	a	6.83	ab	39.17	ab	3.92	ab
75 ml.l^{-1}	25.83	c	25.17	b	7.33	b	40.75	bc	4.08	bc
100 ml.l^{-1}	25.75	c	25.33	b	8.33	c	41.92	cd	4.19	cd
125 ml.l^{-1}	27.25	cd	27.17	bc	8.67	c	43.23	de	4.32	de
150 ml.l^{-1}	28.50	d	28.50	d	9.17	c	44.50	e	4.45	e
LSD 5%	1.58		2.27		0.89		1.94		0.19	

Treatment	Fresh weight per clump (g)		Oven dry weight of tubers per clump (g)		Oven dry yield of tubers per hectare (tonnes)		Oven dry weight per clump (g)		Harvest Index (HI)	
25 ml.l^{-1}	12.83	a	0.79	a	12.83	a	7.94	a	1.64	a
50 ml.l^{-1}	15.23	ab	0.81	a	15.23	ab	8.10	a	1.46	a
75 ml.l^{-1}	15.17	ab	0.83	a	15.17	ab	8.35	a	1.72	a
100 ml.l^{-1}	13.17	a	0.73	a	13.17	a	7.28	a	1.53	a
125 ml.l^{-1}	15.83	b	0.83	a	15.83	b	8.27	a	1.71	a
150 ml.l^{-1}	17.50	b	0.88	a	17.50	b	8.79	a	1.68	a
LSD 5%	2.82		-		0.12		-		-	

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

Table 4. The average of all variables in the treatment of rabbit LOF concentrations on plants soybeans in an intercropping pattern with shallots

Treatment	Maximum plant height (cm)		Maximum number of leaves (strands)		Number of pods per plant (fruit)		Number of pods contained (fruit)		Amount seeds per plant (seed)		Harvest dry weight seeds per plant (g)		Dry yield of seed harvest per hectare (tons)	
25 ml.l^{-1}	36.33	a	42.00	a	44.50	a	41.33	a	81.33	a	23.55	a	3.14	a
50 ml.l^{-1}	38.00	ab	42.17	a	46.00	a	42.00	ab	83.17	a	23.38	a	3.12	a
75 ml.l^{-1}	38.67	abc	44.83	b	50.17	b	46.00	bc	90.67	b	25.42	b	3.39	ab
100 ml.l^{-1}	40.00	bc	45.17	b	52.83	b	49.67	cd	95.50	bc	26.12	bc	3.48	bc
125 ml.l^{-1}	41.17	cd	46.17	b	53.67	bc	49.33	cd	97.67	c	28.20	cd	3.76	cd
150 ml.l^{-1}	43.33	d	48.83	c	57.50	c	52.83	d	106.50	d	30.02	d	4.00	d
LSD 5%	2.59		1.74		3.89		4.05		6.71		2.19		0.29	

Treatment	Harvest dry weight 100 seeds per plant (g)		Fresh weight of legumes per plant (g)		Oven dry weight of seeds per plant (g)		Oven dry seed yield per hectare (tonnes)		Oven dry weight 100 seeds per plant (g)		Oven dry weight per plant (g)	
25 ml.l^{-1}	29.93	a	34.33	ab	18.49	a	2.47	ab	25.93	a	18.96	ab
50 ml.l^{-1}	29.80	a	30.63	a	18.09	a	2.41	a	26.00	a	15.37	a
75 ml.l^{-1}	29.30	a	34.27	ab	19.92	ab	2.66	abc	25.70	a	21.04	ab
100 ml.l^{-1}	29.70	a	36.17	ab	20.37	b	2.72	bc	25.63	a	21.25	ab
125 ml.l^{-1}	29.97	a	39.28	bc	21.72	bc	2.90	cd	25.63	a	22.66	bc
150 ml.l^{-1}	29.63	a	43.48	c	22.95	c	3.06	d	25.50	a	27.42	c
LSD 5%	-		6.86		1.87		0.25		-		6.07	

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

DOI: https://doi.org/10.22225/aj.1.2.4315.57-62

The highest oven dry weight of seeds per plant was obtained at a concentration treatment of 150 ml.l^{-1}, which was 22.95 g, an increase of 26.86% compared to the treatment with a concentration of 50 ml.l^{-1}, which was 18.09 g. Oven dry weight of seeds per plant was supported by maximum plant height, maximum number of leaves, number of pods per plant, number of pods filled per plant, number of seeds per plant and dry weight of seed harvest per plant. The highest yield of oven-dried seeds per hectare was obtained at the concentration treatment of 150 ml.l^{-1}, which was 3.06 tons, an increase of 26.97% compared to the treatment with a concentration of 50 ml.l^{-1}, which was 2.41 tons. Oven dry yield of seeds per hectare was supported by maximum plant height, maximum number of leaves, number of pods per plant, number of filled pods per plant, number of seeds per plant, dry weight of seed harvest per plant and dry yield of seed harvest per hectare.

The high yield of soybean intercropping with shallots is thought to be due to the role of elements contained in rabbit urine such as N, P and K which can stimulate vegetative and generative growth, giving a very real effect. Nitrogen levels in rabbit urine are higher than other herbivorous animals. With the increase in chlorophyll, the photosynthetic activity increases which will also increase the photosynthate produced which will then be transferred to plant organs that are actively carrying out metabolic processes so that the growth of roots, stems and leaves of plants becomes better and will further affect crop yields [11]. Rabbit manure by giving up to 30 tons per ha can increase plant root growth [12]. The results showed that the application of rabbit manure [13,14,15,16,17] on various plants could increase plant growth, especially the real effect seen on plant roots, namely increasing plant nutrient uptake. Therefore, it is necessary to do further research, especially for testing doses of rabbit manure in solid or liquid form to increase plant growth and yield.

4. Conclusion

The treatment of rabbit LOF concentration had a very significant effect on the intercropping yield of shallots and soybeans. The highest fresh weight of tubers per clump was obtained at a concentration of 150 ml.l^{-1}, which was 44.50 g, an increase of 14.72% compared to the treatment with a concentration of 25 ml.l^{-1}, which was 38.79 g. The highest fresh tuber yield per hectare was obtained at the concentration treatment of 150 ml.l^{-1} which was 4.45 tons, an increase of 14.69% compared to the treatment with a concentration of 25 ml.l^{-1} which was 3.88 tons.

The highest harvested dry weight of seeds per plant was obtained at a concentration of 150 ml.l^{-1}, which was 30.02 g, an increase of 28.40% compared to the treatment with a concentration of 50 ml.l^{-1}, which was 23.38 g. The highest dry seed yield per hectare was obtained at the concentration treatment of 150 ml.l^{-1}, which was 4.00 tons, an increase of 27.39% compared to the concentration treatment of 50 ml.l^{-1}, which was 3.14 tons.

The highest seed oven dry weight per plant was obtained at a concentration treatment of 150 ml.l^{-1}, which was 22.95 g, an increase of 26.86% compared to the treatment with a concentration of 50 ml.l^{-1}, which was 18.09 g. The highest oven dry yield per hectare was obtained at the concentration treatment of 150 ml.l^{-1} which was 3.06 tons, an increase of 26.97% compared to the treatment with a concentration of 50 ml.l^{-1} which was 2.41 tons.

Acknowledgments

On this occasion, the author would like to express his deepest gratitude to the lecturers who have guided well until the completion of the final project until the writing of this article and also thanks to all colleagues who have supported and helped a lot.

Reference

[1] Rahayu, E. dan Berlian, N. (2006). Bawang Merah, Penebar Swadaya, Jakarta.
[2] Setijo, (2003). Morfologi tanaman bawang merah, Yogyakarta.
[3] Wibowo, S. (1999), Budidaya Bawang Merah. Penebar Swadaya. Jakarta.
[4] Adisarwanto, T. (2008). Budidaya Kedelai Tropika. Penebar Swadaya. Jakarta. 76 hal.

[5] Purwaningsih, S. (2009). Populasi bakteri rhizobium di tanah pada beberapa tanaman dari Pulau Buton, Kabupaten Muna, Propinsi Sulawesi Tenggara. *Jurnal Tanah Tropika*. 14(1): 65-70.
[6] Guruh dan Riajeng, (2018). Mengkaji Sistem Tanam Tumpangsari Tanaman Semusim. *Procceding Biology Education Conferenc*. 15(1): 791 -794.
[7] Helfi, G. (2015). Respon Tanaman Wortel terhadap Pemberian Urine Kelinci. FP Universitas Muhamadiyah. Jakarta. *Jurnal Agrosains dan Teknologi* 1(1).
[8] Susila S. (2016). Pengaruh Penggunaan Pupuk Cair Daun Kelor dengan Penambahan Kulit Buah Pisang Terhadap Pertumbuhan Tanaman Jagung. PublikaSi Ilmiah. Fakultas Keguruan dan Ilmu Pendidikan, Universitas Muhammdaiyah Surakarta.
[9] Handayani, S. H., Yunus A., dan Susilowati A. (2015). Uji Kualitas Pupuk Organik Cair dari Berbagai Macam Mikroorganiasme Lokas (Mol). *El-Vivo*. 3(1).
[10] Marliah A, Juminil, dan Jamilah. (2010). Pengaruh Jarak Tanam Antar Barisan Pada Sistem Tumpangsari Beberapa Varietas Jagung Manis Dengan Kacang Merah Terhadap Pertumbuhan Dan Hasil. *Agrista*. 14(1).
[11] Kusnendar (2013). Pupuk Organik dari Kotoran Kelinci dan Urine Kelinci. https://www.kusnendar.web.id/2013/06/pupuk-organik-dari-kotoran-dan-urine-kelinci.html.
[12] Mesa, I. M., Situmeang, Y. P., Wirajaya, A. A. N. M., Udayana, I. G. B., & Yuliartini, M. S. (2021). Utilization of rabbit manure and biochar chicken manure and its effect on the growth and yield of pakchoy plants. In *Journal of Physics: Conference Series* (Vol. 1869, No. 1, p. 012045). IOP Publishing
[13] Wirajaya, A. A. N. M., Yuliartini, M. S., & Udayana, I. G. B. (2018). Solid Rabbit Fertilizer Development on Growth and Results Some Varieties of Chili (*Capsicum Frutescens* L.). In *Proceedings of the 1st Warmadewa Research and Development Seminar (WARDS)*. European Alliance for Innovation (EAI).
[14] Atmaja, I. M. D., Wirajaya, A. A. N. M., & Kartini, L. (2019). Effect of Goat and Cow Manure Fertilizer on the Growth of Shallot (*Allium ascalonicum* L). *SEAS (Sustainable Environment Agricultural Science)*, *3*(1), 19-23.
[15] Astari, A. A. Y., Wirajaya, A. A. N. M., & Kartini, L. (2019). Respon Beberapa Varietas Tanaman Kacang Panjang (*Vigna sinensis* L) Pada Pemberian Dosis Pupuk Kandang Kelinci. *GEMA AGRO*, *24*(1), 29-36.
[16] Adi, I. P. T. S., Yuliartini, M. S., & Udayana, I. G. B. (2020). Effect of Rabbit Compost and NPK on The Growth and Yield of Zucchini (*Cucurbita Pepo* L.). *SEAS (Sustainable Environment Agricultural Science)*, *4*(2), 151-156.
[17] Rizky, A. (2020). Respon Konsentrasi Pupuk Biourin Kelinci dan POC Daun Lamtoro terhadap Pertumbuhan dan Produksi Tanaman Okra Merah (*Abelmoschus esculentus* L. Moench). *Kumpulan Karya Ilmiah Mahasiswa Fakultas sains dan Tekhnologi*, *2*(2), 69-69.