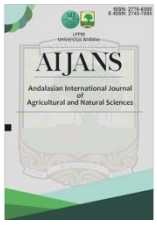
Vol. 4 No. 1 (2023)

Andalasian International Journal of Agricultural and Natural Sciences (AIJANS)

ISSN: 2715-601X (Online)

Available at: http://aijans.lppm.unand.ac.id/index.php/aijans/index

DOI: https://doi.org/10.25077/aijans.v4.i01.61-67.2023



Article

GROWTH AND PRODUCTION OF TWO JOB'S TEARS CULTIVARS (Coix lacrima jobi-L.) AT VARIOUS DOSES OF NPK COMPOUND FERTILIZER (16:16:16)

Nugraha Ramadhan*[1], Indra Dwipa[1]

[1] Department of Agronomy, Agriculture Faculty, Andalas University

Article Information

Received : 2023-02-16
Revised : 2023-02-28
Accepted : 2023-03-16
Published: 2023-03-28

Keywords

Cultivar; fertilizer; Job's tears

*Corresponding Author

nugraharamadhan@agr.unand.ac.id

Abstract

Indonesia has the potential to develop alternative food sources, one of the cereal crops that has the potential and prospects to be developed is job's tears (Coix lacrima-jobi L.). Efforts that can be made to increase job's tears production are variety selection, proper cultivation techniques, and favorable environmental conditions. Fertilization is one of the most important factors that need to be considered in plant cultivation techniques. This research was conducted in Padang city, West Sumatera. The research was factorial in the form of a complete random design. The job's tears cultivars used in this riset were Pulut and Batu. The purpose of this study was to determine the effect of NPK fertilizer on growth and yields of two job's tears cultivars. NPK fertilizer dosage treatment in this study consisted of : 0 kg/hectare, 100 kg/hectare, 200 kg/hectare, and 300 kg/hectare. The results showed that there was no interaction between NPK fertilizer and two job's tears cultivars. Pulut showed the highest mean values on growth variables (plant height, leaf length, and stem diameter), but Batu showed the highest mean values on yield variables (seed weight / plant). While the best dose of NPK fertilizer to increase growth and yield is 300 kg/hectare.

INTRODUCTION

Food security is one of the topics that is always discussed, this is motivated by the problems that arise today in the form of conversion of agricultural land (especially paddy fields) into industrial, plantation and residential areas, very significant population growth each year, and erratic climate change. Clearly, these conditions will pose a threat to a country's food supply. More so if the country only relies on one commodity to be used as a staple food, such as Indonesia, where the majority of the main food commodity is rice. Local food diversification is an option to minimize the dependence of people to consume staple food on one type of commodity only.

Indonesia has the potential to develop alternative food sources, one of the cereal crops that has the potential and prospects to be developed is job's tears (Coix lacrima-jobi L.). This plant has high nutritional value, is easy to cultivate, and is adaptive to various environmental conditions (Nurmala and Irwan, 2007). job's tears has a higher protein content (14-20%) compared to cereals such as rice, wheat, sorghum and corn, while carbohydrates in job's tears also tend to be lower than other cereals at 67-76%. Low-carb foods are very suitable for those on a diet. Although low in carbohydrates, the fat content in job's tears is quite high at around

3.6-7.9%. The fat contained in job's tears consists of unsaturated fatty acids which are good for the body (BB Pascapanen, 2020).

Efforts that can be made to increase job's tears production are variety selection, proper cultivation techniques, and favorable environmental conditions. Fertilization is one of the most important factors that need to be considered in technical plant cultivation. NPK fertilizer is a compound fertilizer that contains nitrogen, phosphorus and potassium nutrients. Assagaf (2017) states that the nitrogen element plays an important role as a constituent of chlorophyll which makes the leaves green. Phosphorus plays an important role in energy transfer in plant cells, encourages root development and early fertilization, and increases uptake at the beginning of growth. While potassium is also very instrumental in plant growth for example to spur the translocation of carbohydrates from leaves to plant organs. The purpose of this study was to determine the effect of applying various doses of NPK fertilizer on the growth and yield of two job's tears cultivars, namely Pulut and Batu.

EXPERIMENTAL SECTION

This research was conducted on community land located in Kuranji District, Padang City, West Sumatra from July to December 2021. The job's tears cultivars used in the study were Pulut and Batu (seeds sourced from private collections), while the NPK fertilizer used was NPK Mutiara (16:16:16). This research was a two-factor factorial experiment with 3 replications arranged in the form of a Randomized Group Design (RAK). The first factor was the use of cultivars, namely Pulut and Batu cultivars. The second factor is the application of NPK fertilizer with different doses, namely: 0 kg/ha, 100 kg/ha, 200 kg/ha, and 300 kg/ha. job's tears was planted in polybags, each plot for each treatment consisted of 10 polybag plants, 5 polybags were used as sample plants. Observation data were analyzed statistically to determine the influential treatment using the F test at the 5% level and significantly different data will be subjected to further testing using the DNMRT test at the 5% level. Observations were made on plant height, stem diameter, leaf length and width, number of seeds per plant, seed weight per plant and 100 seed weight.

Figure 1. Seed display of two job's tears cultivars: (A) Pulut cultivar, (B) Batu cultivar.

The cultivation technique of job's tears plants begins with the preparation of planting media, namely soil and cow manure in a ratio of 3: 1, then the planting media is put into a 10 kg polybag. job's tears seeds were planted only one seed per polybag by ditugal. NPK fertilizer as a treatment was given 2 times at the week after planting 1/3 dose of NPK fertilizer (according to treatment) and at the age of 8 weeks after planting 2/3 dose. Weed control was carried out twice, namely when the plants were 21 HST and 42 HST, mechanically using a koret. Cultivation was carried out by loosening the soil and raising the soil around the plants along with weeding. Harvesting was carried out at the age of 20 weeks after the plants reached physiological maturity.

RESULT AND DISCUSSION

RESULTS AND DISCUSSION

1. Plant height and stem diameter

The treatment of various doses of NPK fertilizer on two job's tears cultivars affects the increase in plant height and stem diameter characters, but the two treatments do not show interactions on the observed characters. Pulut cultivar job's tears has a higher size than the batu cultivar, the growth of this cultivar plant height can reach more than 2 meters, it can be seen in Table 1 that the difference in plant height between the two cultivars is so significant. In line with the results of research by Qosim *et al*. (2013) on four genotypes of pulut job's tears showed that the range of plant height in this genotype was 114.83 - 253.67 cm. Ruminta *et al*. (2018) also concluded that from the results of their research, pulut job's tears without treatment had a plant height of 239.75 cm. The difference in growth of each cultivar is closely related to the genetics of the plant itself. Harjadi (1991) states that in every plant variety there are always differences in genotypic responses to various environmental conditions where they grow. This situation makes phenotypic differences in each job's tears cultivar.

Table 1. Plant Height and Stem Diameter of Two Job's tears Cultivars at Various Doses of NPK Fertilizer.

Cultivars	Doses (kg/ha)				Average
	0	100	200	300	
Plant Height			**cm**		
Pulut	213,42	226,23	231,43	245,42	229,13 a
Batu	170,25	172,85	180,80	186,60	177,62 b

Average	191,84 B	199,54 B	206,11 AB	216,01 A	
Stem Diameter			**cm**		
Pulut	0,90	0,97	1,00	1,13	1,00 b
Batu	1,13	1,17	1,23	1,23	1,19 a
Average	1,02	1,07	1,12	1,18	

Notes: Numbers followed by different lowercase letters in the same column and numbers followed by different uppercase letters in the same row are significantly different according to the DNMRT further test at the α 0.05 level.

Gardner *et al*. (1991) state that internal factors stimulating plant growth are in genetic control, but climate, soil, pests, diseases, weeds and nutrients can also affect plant growth and yield. This can be seen from the increasing dose of NPK fertilizer given that can increase plant height in job's tears. The function of N for plants is to stimulate meristematic activity, with the increasing amount of N absorbed by plants, the meristematic tissue at the stem growth point is increasingly active. According to Jumin (2002) nitrogen functions to stimulate budding and increase plant height. While potassium plays a very important role in plant growth, for example to spur the translocation of carbohydrates from leaves to plant organs (Assagaf, 2017). So that the treatment of NPK 200 kg/ha is the best dose to increase plant height in job's tears.

The diameter of the stem in its growth is not significantly influenced by the application of NPK fertilizer, even though the dose of NPK fertilizer is increased to 300 kg/ha but this does not have an effect on increasing the diameter of the job's tears stem. However, Table 1 shows that each cultivar has a different stem diameter size. The difference in stem diameter size in the two cultivars is certainly influenced by genetic differences in each cultivar. The size of the stem diameter in the batu cultivar is greater at 1.19 cm, compared to the job's tears cultivar which is only 1 cm. Mustofa *et al.* (2013) mentioned that differences and similarities in each qualitative and quantitative character are determined by each gene by involving the influence of the existing environment. Based on the existing phenomena, it can be concluded that the emergence of the same characters between varieties may be caused by the presence of genes that make up the same phenotype and are influenced by the environment so that they give rise to relatively similar phenotypes. Similarly, the emergence of character differences between varieties may be caused by the influence of different genes.

2. Leaf Length and Width

Table 2. Length and Width of Leaves of Two Job's tears Cultivars at Various Doses of NPK Fertilizer.

Cultivars	Doses (kg/ha)				Average
	0	100	200	300	
Length Leaves			**cm**		
Pulut	45,70	45,80	49,69	51,89	48,27 a
Batu	40,97	42,04	48,03	48,84	44,97 b
Average	43,34 B	43,92 B	48,86 A	50,37 A	
Width Leaves			**cm**		
Pulut	4,13	4,23	4,53	4,57	4,37
Batu	3,91	4,46	4,69	4,89	4,49
Average	4,02 B	4,35 AB	4,61 A	4,73 A	

Notes: Numbers followed by different lowercase letters in the same column and numbers followed by different uppercase letters in the same row are significantly different according to the DNMRT further test at the α 0.05 level.

Based on the results of the analysis of variance, the treatment of NPK fertilizer showed an effect on the variables observed. Increasing the dose of NPK fertilizer affects the increase in length and width of job's tears leaves. It can be seen in Table 2 that the application of NPK fertilizer at a dose of 200 kg/ha shows the best treatment with an average value of leaf length of 48.86 cm and leaf width of 4.61 cm. Differences in the growth of leaf length and width are due to differences in the availability of nutrients or nutrients in the soil. The higher the dose of NPK fertilizer applied, the greater the amount of N, P and K nutrients available in the soil that can be absorbed by plants for various metabolic processes needed for growth and production. Sutejo (1992) states that nitrogen nutrient is one of the macro nutrients for plant growth, which is generally needed for vegetative growth of plants such as roots, stems and leaves. In line with the opinion of Lingga (2001), nitrogen in sufficient quantities plays a role in accelerating overall plant growth, especially stems and leaves. Not only environmental factors (availability of nutrients) that affect the growth of job's tears, genetic factors also affect the growth of job's tears leaf length. It can be seen in Table 2 that the pulut cultivar has a longer leaf length than the batu cultivar, the difference in leaf length of these two cultivars is 3.3 cm.

3. Number and Weight of Seeds per Plant

Based on the table of variance, it shows that cultivar differences only affect the weight of seeds per plant, while differences in NPK dosing affect the variable number and weight of seeds per plant (Table 3). Although the number of seeds per plant between the two cultivars is not significantly different, the batu cultivar has a heavier seed weight per plot than the pulut cultivar, this is because the batu cultivar has a larger seed size than the pulut cultivar (Figure 1). Maobe *et al*. (2014) reported that seed weight is a characteristic of each plant variety, so each variety may have different weights. According to Irwan *et al*. (2017) pulut job's tears has a small seed character with a 100 seed weight of 11.90 - 12.93 grams.

Tabel 3. Number of Seeds per Plant, Seed Weight per Plant and 100 Seed Weight of Two Cultivars of Job's tears at Various Doses of NPK Fertilizer.

Kultivar	**Doses (kg/ha)**				**Average**
	0	**100**	**200**	**300**	
Number of Seeds/Plant	**grain**				
Pulut	106,42	146,17	200,59	277,97	182,79
Batu	137,88	183,38	212,09	275,15	202,13
Average	122,15 C	164,78 BC	206,34 B	276,56 A	
Seed Weight/Plant	**gram**				
Pulut	14,01	19,66	23,45	34,75	22,97 b
Batu	26,47	33,47	41,56	50,76	38,07 a
Average	20,24 C	26,56 BC	32,51 B	42,76 A	
Weight of 100 Seeds	**gram**				
Pulut	11,81	11,80	11,63	12,08	11,83 b
Batu	17,60	17,54	18,22	18,17	17,88 a
Average	14,71	14,67	14,92	15,13	

Notes: Numbers followed by different lowercase letters in the same column and numbers followed by different uppercase letters in the same row are significantly different according to the DNMRT further test at the α 0.05 level.

Along with the increase in the dose of NPK fertilizer on job's tears, this affects the increase in the number and weight of seeds per plant. Table 3 shows that the treatment with a dose of 300 kg/ha NPK fertilizer showed the best results compared to the other treatments, this treatment was able to increase the number of seeds to 276.56 grains per plant very significantly when compared to the treatment without NPK fertilizer. Similarly, in the seed

weight variable, the treatment with 300 kg/ha NPK fertilizer increased the yield to 42.76 grams per plant.

The addition of NPK fertilizer doses has an effect in increasing the number and weight of seeds. According to Gardner *et al*. (1991), seed weight is more influenced by the distribution of assimilates during seed filling. High accumulation of assimilates requires more storage containers, therefore the higher the availability of nutrients needed by plants will increase the yield in the form of the number and weight of seeds. Goldsworthy and Fisher (1992) stated that nitrogen supply has a major influence on the number of seeds and further affects yield. Plants that experience nitrogen deficiency between planting and initiation only produce small yields compared to plants that have sufficient nitrogen supply.

There was no effect of NPK application on the weight of 100 job's tears seeds. Table 3 shows that the average weight of 100 seeds ranged from 14.67 - 15.13 g. This is supported by Dwipa's statement. This is supported by the statement of Dwipa *et al*. (2022) that the weight of 100 grains of some job's tears accessions found from exploration activities in West Sumatra is 11.86 - 41.43 g. Qosim *et al*. (2013) added that the four genotypes of job's tears rice cultivars used in their tests had a range of 100-grain weights of 9.39 - 18.16 g. The absence of the effect of NPK fertilizer application on the weight of 100 grains was not significant. The absence of the effect of NPK fertilizer on increasing or decreasing the weight of 100 seeds of job's tears is probably because the weight of 100 seeds is more influenced by genetics.

CONCLUSION

Based on the research that has been carried out, it can be concluded that there is no interaction between the two factors tested on the observed variables. Pulut cultivar showed the highest average value on growth variables (plant height, leaf length, and stem diameter), but batu cultivar showed the highest average value on yield variables (seed weight/plot and 100 seed weight). While the best dose of NPK fertilizer to increase the growth and yield of job's tears is at a dose of 300 kg/ha.

REFERENCES

Assagaf , S. 2017. Pengaruh Pemberian Pupuk NPK Mutiara Terhadap Pertumbuhan dan Produksi Jagung (Zea mays) di Desa Batu Boy Kec. Namlea, Kab. Buru. Jurnal Ilmiah Agribisnis dan Perikanan 10 : 72-78.

BB Pascapanen. 2020. Buku Saku - Bahan Pangan Potensial untuk Anti Virus dan Imun Booster. Kementerian Pertanian Indonesia.

Dwipa, I., Martinsyah, R.H., Pamuji, P.A.N., Ardana, G., and Ramadhan, N. 2022. Exploration and Characterization of job's tears in West Sumatra. Jurnal Agronomi Tanaman Tropika, 4 (1) : 75 - 86.

Gardner, F.P., R. B. Pearce and R. I. Mitchell. 1991. Fisiologi Tanaman Budidaya. Universitas Indonesia press, Jakarta. 428 hlm.

Goldsworthy and Fisher. 1992. Fisiologi Tanaman Budidaya Tropik (terjemahan dari The Physiology of Tropical Field Crops oleh Tohari). Gadjah Mada University Press. Yogyakarta.

Harjadi, M. M. 1991. Pengantar Agronomi. Gramedia Pustaka Utama. Jakarta. 172 hlm.

Jumin, H. B. 2002. Dasar-dasar Agronomi. Jakarta: PT Raja Grafindo.

Maobe S.N., Martha K. Nyang'au, E.A. Basweti, A. Getabu, T.J. Mwangi and A.R. Ondicho. 2014. Effect of plant density on growth and grain yield of finger millet (Eleusine coracana) under high potential conditions of Southwest Kenya. World Journal of Agricultural Sciences 10 (6): 261-268.

Mustofa, Z., I Made, B., dan Gamar, B.N.S. 2013. Variasi Genetik Jagung (Zea mays) Berdasarkan Karakter Fenotipik Tongkol Jagung yang Dibudidaya di Desa Jono Oge. e-Jipbiol 1 : 33 - 41.

Nurmala, T dan Irwan, A.W. 2007. Pangan Alternatif: Berbasis Serealia Minor. Penerbit Giratuna. Bandung.

Qosim, W.A., Tati, N., Aep, W.I., dan Martha, C.D. 2013. Pengaruh Pupuk NPK dan Pupuk Hayati BPF Terhadap Karakter Pertumbuhan dan Hasil Empat Genotip job's tears (Coix lacrima jobi L.). Jurnal Pangan 22 : 357 - 364.

Ruminta, T. Nurmala, Y. Yuwariah, dan N.Y., Pratiwi. 2018. Respon Pertumbuhan dan Hasil job's tears pada Panen Awal Akibat Pemberian Dosis Pupuk Biosilika dan Paklobutrazol di Lahan Kering Jatinangor. Jurnal Kultivasi 17 (3) :694-700.

Sutejo, M. M. 1992. Tanaman Jagung. Penebar Swadaya. Jakarta. 59 hlm.