Concentration Of Sheep Urine Solution As Watering Media And Organic Fertilizer To Production Of Corn Fodder (*Zea mays*) By Hydroponic System

T I W Kustyorini\*1, A T N Krisnaningsih1 and R P Pratama1

1Departement of Animal husbandry, Universitas Kanjuruhan Malang

S Supriyadi Street, No 48 Malang-Indonesia

\*triida@unikama.ac.id

**Abstract.** Urine is an alternative to organic fertilizers. In this study, urine solution was used as a planting medium and organic fertilizer for hydroponic corn fodder. The treatments in this research, namely T0 (0% urine), T1 (5% urine), T2, (10% urine), T3 (15% urine), T4 (20% urine). The variables in this study were the percentage of germination, percentage of normal sprouts, number of leaves, plant height, fresh production and dry matter production. The data obtained were analyzed using analysis of variance, if there is an effect, then continue with the LSD test. The results showed that the concentration of urine solution as a watering medium and organic fertilizer had a very significant effect (P <0.01) on the percentage of germination, percentage of normal germination, number of leaves, plant height, fresh production, and dry matter production. The highest germination percentage was found in T1 (91.60%), normal germination percentage T1 (86.78%), number of leaves T1 (3.0 strands), plant height T0 (31.6 cm), forage production T1 (646.6 grams), dry matter production T1 (568.41 grams). Based on the results, it was concluded that watering with 5% concentration of sheep urine solution gave the best value for the productivity of hydroponic corn fodder.

.

1. Introduction

The problem in developing ruminants is the difficulty of forage availability, especially during the dry season. This can cause a decline in livestock productivity and many farmers sell their livestock at a price that is relatively cheaper than the rainy season. One way that can be used as a solution to maintain feed production with minimal soil or land conditions is through hydroponic media. Hydroponics is a way of planting without using soil media. Soil media can be replaced with water, gravel or even charcoal can be used as a hydroponic medium. Hydroponics has many advantages, among others, it does not require too much space, maintenance is not too complicated and the possibility of pest disturbance is less.

Hydroponics can be used as an alternative technology for producing forage feed. Hydroponic fodder has advantages, does not require soil media, does not require large areas of land and has high nutrient content, namely protein content reaching 22.6% [1]. The hydroponic system does not depend on the season so that plants can be planted throughout the year and can be planted in narrow and less fertile land, making it possible to get very good crop yields [2]. But in its application, hydroponics also still requires fertilization to get optimal results. One of the efforts to fulfill these nutrients is by providing liquid organic fertilizer with urine solution.

Several studies have shown that the use of livestock urine provides better results on crop productivity. [3] showed that giving cow urine with a concentration of 5% had an effect on the increase in the number of palm fronds, dry weight and nutrient uptake of N, P, K, Ca, and Mg in oil palm seedlings in the main nursery. Research by [4], the provision of fermented goat urine liquid organic fertilizer with a concentration of 200 ml / l provides the best vegetative growth in pepper plants. Research by [5], using soil media and coffee husk compost with a ratio of 2: 1 or 3: 1 and giving rabbit urine gave the best effect on plant height, stem diameter and number of leaves of coffee plants, and use of soil media and leaf compost ( 3: 1) with rabbit urine. [6], stated that the use of several types of livestock urine as liquid organic fertilizer with different concentrations of oil palm plants (*Elaeis guineensis* Jacq.)

METHOD

The research method used was a field experiment using a completely randomized design (CRD) with 5 treatments and 5 replications. If it shows a real effect, it will continue with the LSD test. The treatments carried out are:T0 = Watering with control water, T1 = Watering with a 5% concentration of sheep urine solution, T2 = Watering with a 10% concentration of sheep urine solution, T3 = Watering with a 15% concentration of sheep urine solution, T4 = Watering with a 20% concentration of sheep urine solution.

The variables observed in this study were the percentage of germination, percentage of normal sprouts, number of leaves, plant height, production of fresh forage, and production of dry matter. The data obtained were analyzed using analysis of variance, if there were differences, a further test was carried out using the LSD test

RESULTS

Based on the results of research on the concentration of sheep urine solution as a watering medium and organic fertilizer, it was shown that there was a very significant effect (P <0.01) on the percentage of germination, the percentage of normal sprouts, number of leaves, plant height, fresh production, and dry matter production. The average results of the study are presented in Table 1.

Table 1. Average Research Results

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Treatment | Parameters | | | | | |
| Germination Percentage (%) | Normal Germination Percentage (%) | Number of leafs | Plant height (cm) | Fresh production (g) | Dry Matter Production (g) |
| T0 | 64,56±8,22a | 81,24±6,73b | 3,0±0,00b | 31,6±2,30b | 467,4±54,17b | 418,51±48,51b |
| T1 | 91,60±7,40b | 86,78±6,06b | 3,0±0,01b | 29,8±4,82b | 646,6±67,37d | 568,41±72,50c |
| T2 | 85,20±9,55b | 76,07±4,16a | 2,8±0,45b | 27,4±4,34b | 577,6±46,88c | 548,62±26,77c |
| T3 | 73,92±8,88a | 75,80±3,06a | 2,4±0,55a | 18,4±4,62a | 548,8±47,10c | 451,74±74,30b |
| T4 | 69,58±7,75a | 73,65±4,46a | 2,2±0,45a | 16,6±3,97a | 363,4±52,18a | 332,88±17,26a |

**Germination Percentage (%)**

Based on the results of analysis of variance, it showed that the effect of different concentrations of sheep urine solution as watering media and organic fertilizer had a very significant effect (P <0.01) on the percentage of germination. The average results of the study are presented in table 1.

The highest germination percentage was found at (T1) at a concentration of 5% with an average value of 91.60% and very significantly different from (T2) at a concentration of 10% with an average value of 85.20%, and the lowest percentage of germination at (P0) with 100 % water without sheep urine with an average value of 64.56%. This is because the treatment (T1) has the media moisture and the nutrients needed by the plant are met [6] states that the planting medium that is too much water (drainage is not good) and too moist can cause the plant to be less able to absorb nutrients properly. inhibition of root growth and development can inhibit nutrient absorption. This statement is in accordance with the opinion of [7] that the germination success rate can be increased by various treatments before planting, the treatment that is often used is immersion to stimulate root growth with various immersion times that vary according to the dose and type of plant. [4] stated that the successful germination percentage of reaching 80% of these results can be a reference for planting on corn fodder.

**Percentage of Normal Sprouts**

Based on the results of analysis of variance, it showed that the effect of different concentrations of sheep urine solution as watering media and organic fertilizer on the productivity of corn fodder had a very significant effect (P <0.01) on the percentage of normal sprouts. The highest percentage of normal sprouts was found at (P1) with a concentration of 5% with an average value of 86.78% which was quite different from (P2) 10% concentration with an average value of 76.07%, and the lowest percentage of germination at (P4) with 20% with an average value of 73.65%. Treatment (P1) is better because at (P1) more water needs and seed growth, because the percentage of germination in treatment (P1) is also good. This statement is in accordance with the opinion of [8], the standard of normal sprouts is 70% and states that if the water needs in watering are not appropriate then the seed growth will be destructive or inhibit growth.

**Number of Leaves**

Based on the analysis of variance, it showed that the concentration of different sheep urine solutions as watering media and organic fertilizers on the productivity of corn fodder had a very significant effect (P <0.01) on the number of leaves. The highest number of leaves was found in treatment (P1) with an average number of leaves of 3.0, and the lowest number of leaves was in treatment (P4) with a concentration of 20% of sheep urine solution with an average of 2.2 strands.

Differences in treatment and different concentrations at (P1-P4) had an effect on the number of leaves. The addition of sheep urine has an effect on the number of leaves, the highest number of leaves is found in concentration with the addition of sheep urine by 5%, this is seen from the average number of leaves in plants, because plants have a limit of nutrient absorption for their life. When giving a dose of liquid organic fertilizer from urine as much as 32 ml / polybag, the number of leaves does not increase because after the dose of liquid organic fertilizer from urine is increased, the plant will experience nutrient saturation so that the plant is unable to absorb nutrients optimally which results in a decrease in the number of leaves produced. .

The application of high concentration fertilizers to a certain extent will cause increased yields, and at concentrations that exceed a certain limit will cause the yield to decrease and also the plants will grow well if the nutrients provided are in a balanced amount and in accordance with the needs of the plant [9]. At (P0) it has the same number of leaves on (P1) but the stem diameter (P0) is small even though the number of leaves is the same as (P1) this is due to the treatment using water alone, the number of leaves and stem height is quite high, otherwise This is the case with (P1) using a concentration of 5% urine and 95% water, the number of leaves on average is the same as (P0) but the stem diameter and other aspects are also good. This is because the concentration of sheep urine solution with a higher dose has a bad effect, such as the delay in the development of leaf release in plants on the height of the stem internodes in maize where the leaves are released, so that if the plant has a long stem size, the number of leaves of the plant is also more. much will be related to the process of plant assimilation [8].

**Plant height**

Based on the analysis of variance, it showed that the concentration of different sheep urine solutions as watering media and organic fertilizers on the productivity of corn fodder had a very significant effect (P <0.01) on plant height. The highest average plant height was found in the treatment without using sheep urine solution at (P0) with a value of 31.6 cm and very significantly different from the lowest average value on plant height using the concentration of 20% sheep urine solution at (P4) with a value of 16.6 cm . Low plant height growth is caused by plants experiencing environmental stress (high nutrient temperature), so the plants do not grow optimally. Treatment (P0) has a higher stem height because at (P0) it does not use a sheep urine mixture so that water alone without the addition of sheep urine is a factor why at (P0) the stems are higher than treatment using additional sheep urine. Therefore, nutrients are useful for stimulating plant growth, increasing node growth, resulting in an increase in plant height. Plants will grow well if they are encouraged by the application of nitrogen fertilizers to support their growth and development [9]

**Fresh Forage Production**

Based on the analysis of variance, it showed that the concentration of different sheep urine solutions as watering media and organic fertilizer on the productivity of corn fodder had a very significant effect (P <0.01) on fresh production. The highest average fresh plant production was found in the treatment using the concentration of 5% sheep urine solution (P1) with a value of 646.37g which was very significantly different in the treatment with a urine solution concentration of 20% in treatment (P4) with the lowest yield at an average of 363.4 g . Treatment (P1) has the highest value, it can be seen from the results of a high percentage of germination, the greater the percentage of germination, the higher the yield, the quality of the seeds in germination greatly affects production, the better the quality of the seeds, the better the results will be obtained.

[10] stated that the higher the sprouts / shoots on the plant, the higher the growth and the effect on plant production, so that it could accelerate the cutting life (harvest) This result is also balanced with the percentage of normal sprouts that grow in treatment (P1) with a concentration of 5% giving a high value so that the production yield is also high. According to [11], a seed lot with a higher viability will be able to produce a greater sprout dry weight. Measuring the dry weight of sprouts is a more quantitative and objective measure. Plant growth and yield activities are influenced by the number of leaves as a place for photosynthetic activities to produce energy that will be needed for the plant growth process. In addition, the number of leaves is also related to plant height, because the higher the plant, the more leaves are formed. [12] According [13] Production Standard Fodder in corn produced from corn kernels as much as 713 grams can produce about 2 times as much fresh forage at 13 days of harvest. [14] stated that Fodder from 1 kg of corn kernels planted with a hydroponic system can produce 6-10 kg of fresh forage for approximately 2 weeks.

**Dry Material Production**

Based on the analysis of variance, it showed that the concentration of different sheep urine solutions as watering media and organic fertilizer on the productivity of corn fodder had a very significant effect (P <0.01) on dry matter production. The highest average dry matter production was found in treatment with a concentration of 5% at (P1) with a value of 568.41g and a very significant difference with the lowest average dry matter production found in treatment (P4) with a concentration of 20% sheep urine with a value of 332.88g. This indicates an increase in the value of dry matter with the addition of urine, with a concentration of 5% being the best. [3] stated that an increase in forage fresh production is accompanied by an increase in dry production. [14] added that cutting age affects fresh production and dry production of a forage. According [15] the value of KCBK D. cinereum with a spacing of 50 x 75 cm is 54.25% and the KCBO D. cinereum value is 58.12% in vitro. These results indicate an increase in dry matter production after treatment according to existing plant standards.

**Conclusion**

Based on the results of the research that has been done, it can be concluded that the concentration of adding 5% sheep urine and 95% water as a watering medium and organic fertilizers can increase the production of corn fodder productivity.

**References**

[1] Gebremedhin WK . 2015. Effect of growing media on nutrient profile of conventional and hydroponic maize fodder. *Int Journal of Sci*. Research*.* 4(9):223-225.

[2] Sudarmodjo. 2008. *Pengenalan Sistem Hidroponik [Paper untuk Kalangan Sendiri]*. Bogor: Parung Farm

[3] Syarovy, M. E. N. Ginting, D. Wiratmoko dan H. Santoso. 2015. Optimalisasi Pertumbuhan Tanaman Kelapa Sawit di Tanah Spodosol. *Jurnal Pertanian Tropik*. Vol 5 No 2.

[4] Sarah, H. Rahmatan, dan Supriatno. 2016. *Pengaruh pemberian berbagai konsentrasi urin kambing yang difermentasi terhadap pertumbuhan vegetatif lada (Piper nigrum L.). Ilmiah Mahasiswa Pend. Biologi 1(1): 1–9.*

[5] Rosniawaty, S., R. Sudirja, dan H. Hidayat. 2017. *Pemanfaatan limbah organik sebagai media tanam dan aplikasi urin ternak pada pembibitan kopi (Coffea arabica l .).* Kultivasi 16(1): 287–292

[6] Alvi, B. dkk. 2018*. Pemanfaatan beberapa jenis urin ternak sebagai pupuk organik cair dengan konsentrasi yang berbeda pada tanaman kelapa sawit (Elaeis guineensis Jacq.)* di pembibitan utama

[7] Irwanto. 2001. *Pengaruh Hormon IBA (Indole Butyric Acid) terhdap Persen Jadi Stek Pucuk Meranti Putih (Shorea montigena*). Universitas Patimura. Ambon.

[8] Hermawan. 2011. *Pengaruh penyiraman terlalu banyak dilakukan maka pertumbuhan benih tersebut akan bersifat merusak atau penghambat pertumbuhan*. Fakultas Peternakan Universitas Diponegoro. Semarang

[9] Keraf, F. K., Y. Nulik dan M. L. Mullik. 2015. Pengaruh pemupukan nitrogen dan umur tanaman terhadap produksi dan kualitas rumput kume (Sorghumplumosum var. timorense). *Jurnal Peternakan Indonesia* 17: 123--130.

[10 ] Risva AH, Tohari, Sri NHU. 2014. Takaran pupuk nitrogen dan silika terhadap pertumbuhan awal (Saccharum officinarum L) pada inceptisol. Vegetalika. 3:35-44.

[11] Ilyas, S. 2010. *Ilmu dan Teknologi Benih*. Teori dan Hasil-hasil Penelitian. Institut Pertanian Bogor. Bogor.

[12] Fahrudin, F. 2009. *Budidaya Caisim (Brassica juncea L.) Menggunakan Ekstrak Teh dan Pupuk Kascing*. Skripsi. Fakultas Pertanian. Universitas Sebelas Maret. Surakarta.

[13] Prihartini, R. 2014*. Hidroponik Fodder Sebagai Pakan Alternatif Untuk Memenuhi Kekurangan Hijauan Bagi Sapi Perah Selama Musim Kemarau*. Skripsi. IPB. Bogor

[14] Fuskha, E., Karno, dan F. Kusmiyati. 2009. Efek Salinitas dan Pemberian Fosfor terhadap Aktivitas Enzim Nitrogenase Nodul Akar Caliandra Callothyrsus. *Jurnal Pengembangan Peternakan Tropis*. ISSN. 0410- 6320.

[15] Mansyur, H. Djuned,T. Dhalika, S. Hardjosoewignyo, dan L. Abdullah. 2005. Pengaruh interval pemotongan dan inveksi gulma Chromolaena odorata 47 terhadap produksi dan kualitas rumput Brachiaria humidicola. *Media Peternakan* : 77—86.