Jurnal Info Sains : Informatika dan Sains
Volume 14 , Number 01, 2024, DOI 10.54209/infosains.v14i01
ESSN 2797-7889 (Online)
https://ejournal.seaninstitute.or.id/index.php/InfoSains

Effect Of KCL Fertilizer Doses on Growth and Yield of Tomato (Lycopersicum Esculentum, Mill) Plant in Polybags

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Article Info
Keywords:
Tomato (Lycopersicum esculentum, Mill),
KCL dose,
when flowers appear

ABSTRACT
Tomato plants (Lycopersicum esculentum, Mill) are fruit vegetable plants that people need every day. Procurement of tomatoes can be cultivated in polybag containers, planted in the yard or on the moor. The ability of tomato plants to grow in polybag containers requires nutritional support in the right dose, right type and at the right time so that production is optimal. One factor that needs to be considered is the vegetative growth process and preventing flower loss. The dry season greatly affects the plant growth process. By administering a dose of KCl to tomato plants, it is hoped that it will increase growth and prevent flower loss, making the process of flowers becoming fruit more optimal. The research was structured in a Randomized Block Design (RAK) consisting of 7 levels, namely D1=6 gr/plant, D2=7 gr/plant, D3= 8gr/plant, D4= 9gr/plant, D5=10gr/plant, D6=11gr/plant, D7= 12gr/plant, each treatment was repeated 3 times. The parameters that are considered are plant height, number of leaves, age at flower emergence, number of flowers, total number of fruit and fruit weight (g/plant). The results of the research showed that treatment with various doses of KCl fertilizer had no effect on the growth of plant height and number of leaves. A dose of 10 g/plant gave an increase of 0.89% in the age at which flowers appeared and an increase of 3.33% in the number of flowers compared to the recommended dose of 9 g/plant.

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INTRODUCTION

Meeting the basic needs of life is increasing along with population growth, resulting in land conversion from agricultural land to land for non-agricultural activities. Wise use of land can support food security because this condition is related to food sufficiency for all elements of society. To realize food independence, the government is trying to revive the culture of planting in home gardens. The Ministry of Agriculture has developed a concept called the Sustainable Food House Area (KRPL) which was built from a Sustainable Food House (RPL) with the principle of using environmentally friendly yards to fulfill the family's food and nutritional needs, as well as increasing income which will ultimately improve welfare through community participation (Ministry of Agriculture, 2011). The limitations of cultivating plants in urban areas or limited land such as home gardens can be done using

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polybags. The ability of tomato plants to grow in polybag containers requires nutritional support in the right dose, right type and at the right time so that production is optimal. What you need to pay attention to when cultivating tomatoes in polybags is during the vegetative growth process and preventing flower loss. The dry season greatly affects the plant growth process. Very hot solar radiation causes an increase in air temperature and soil temperature which greatly influences the process of flower and fruit formation.

One of the reasons causing a decrease in tomato production is flower loss or flower fall. Flower loss can be caused by several factors such as high environmental temperatures, failure to flower, lack of water during flowering, and lack of one of the important nutrients. Lack of potassium in plants can cause symptoms such as weak plant growth, flower drop, declining fruit quality, small fruit size, and necrosis of old leaves (Ambarwati et al., 2020). Tomato plants have the ability to absorb around 1-5% of the dry weight of the plant. The potassium element is very important for tomato plants because it plays a role in growth and improving fruit quality (Soebari, 2019). It is important to ensure tomato plants receive an adequate supply of potassium to prevent excessive flower drop. This can be done by fertilizing with KCL fertilizer at the right dose during the flowering stage. The flowering process is stimulated by macronutrients, one of which is the nutrient potassium. Potassium macronutrient compounds can increase generative growth in plants, this includes the formation of flowers and fruit in tomato plants (Salli and Yosefina, 2019). It is hoped that the application of cultivating tomato plants in polybags with KCL fertilizer will be able to respond to tomato plants in increasing plant growth and yield. The research aims to obtain the right dose of KCL for tomato plants planted in polybags.

METHODS

The research was carried out at the Experimental Garden of the Faculty of Agriculture, National Development University "Veteran" East Java, which is located at 7° 9'-7° 21' South Latitude and 112° 36'-112° 54' East Longitude with an altitude of between 3-6 meters above sea level . Servo F1 variety tomato plant seeds, use polybags measuring 40 x 40 cm with mixed media of garden soil, compost, husks, goat manure (v:v :v:v:).

This research was an experiment arranged in a one-factor Randomized Block Design (RAK) and repeated three times for each treatment. The KCl fertilizer dosage factor consists of 7 levels as follows: D1 = 150kg/ha (6gr/plant), D2 = 175kg/ha (7gr/plant) D3 = 200kg/ha (8gr/plant) D4 = 225kg/ha (9gr /plant) plant) D5 = 250kg/ha (10gr/plant) D6 = 275kg/ha (11gr/plant), D7 = 300kg/ha (12gr/plant)

Carrying out the research, Servo variety tomato seeds were soaked in clean water for approximately 15 minutes to select seeds that sank. Seeding is done on plastic seedlings with soil planting media. Plant tomato seeds then cover with a little planting medium and spray with water using a hand sprayer. Transplant into polybags when they are 14-21 days after sowing. Preparation of planting media is done by mixing soil, goat manure, husks and compost in a ratio of 1:1:1:1 (v:v :v:v) evenly mixed in. into a 40x40 cm poly bag with a capacity of 5 kg. Planting is done by making a hole in the middle of the planting medium approximately 5-7 cm deep then the seeds are inserted and backfilled. Caring for tomato

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plants includes watering, installing stakes, fertilizing, weeding, replanting, controlling pests and diseases. Installation of stakes and labels is carried out at the same time as transplanting or moving plants into polybags. The stakes used are made of bamboo with a size of 1-2 meters. The stake is then labeled and stuck in a polybag. Fertilization is given three times, namely before planting (basic fertilizer), 0 HST, and 14 HST. Fertilize by digging. The schedule for giving and dosage of fertilizer can be seen in the table below

Table 1. Schedule for implementing fertilization on tomato plants

Type Fertilizer	Total Dose	Planting Dosage Schedule (basic)	(0HST)	(14HST)	car
Urea	6gr/tan	3gr	3gr	-	Ditugal
SP-36	10gr/tan	2gr	4gr	4gr	Ditugal
KCl D1	6gr/tan	-	3gr	3gr	Ditugal
KCl D2	7gr/tan	-	3,5gr	3,5gr	Ditugal
KCl D3	8gr/tan	-	4gr	4gr	Ditugal
KCl D4	9gr/tan	-	4,5gr	4,5gr	Ditugal
KCl D5	10gr/tan	-	5gr	5gr	Ditugal
KCl D6	11gr/tan	-	5,5gr	5,5	Ditugal
KCl D7	12gr/tan	-	6gr	6gr	Ditugal

Watering shots are done once a week. Pest control is carried out by applying insecticides as recommended, such as bomber stick dose 2ml/l, Reagent 50 SC dose 0.5ml/l, Prevathon 50 SC dose 1ml/l, Abacel 18 EC dose 0.5ml/l, Spontan 400 SL dose 0 .5ml/l, Samite 135 EC dose 0.5ml/l. Disease control can be done by spraying the fungicide Antracol 70 WP at a dose of 2 gr/l. Control is carried out before and when the plant begins to show signs of pest and disease attack or conditionally. The parameters observed are Plant Height (cm), Number of Leaves Per Plant (pieces), Age at which Flowers Appear (DAS), Number of Flowers (flowers), Number of Fruits and Fruit Weight (g/plant) and Experimental Garden Temperature (0C)

RESULTS AND DISCUSSION

Results

Plant height

Results an a l i s is variety shows that dosage treatment fertilizer K C l has no real influence on all age watch tall tomato plants . Average height of tomato plants in various regions K C l fertilizer dose is served on Tab e l 1.

Table 1. Average Height of Tomatoes (cm) in Treatment Dose K C l Age 7, 14,21,28 and 35 HST,

KCL dosage (g/plant)	Plant Height (cm)				
	7 hst	14 hst	21 hst	28 hst	35 hst
6	14.33	20.50	37.44	61.33	83.78
7	13.94	18.94	34.50	60.11	81.22
8	13.61	19.00	34.44	59.22	80.89
9	14.22	19.89	35.61	58.89	78.11
10	14.61	20.83	38.00	62.56	83.33

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11	16.17	22.67	39.67	63.56	84.56
12	14.72	20.17	35.33	59.22	81.89
BNJ 5%	Mr	Mr	Mr	Mr	Mr

Notes: tn: not significantly different, hst= days after planting

In Table 1. It appears that the results of the analysis of variance in plant height were not significantly different between the KCL dose treatments. Observations of plant height from 7 DAP to 35 DAP showed a significant increase in the average per week from 14.33 cm to 83.78 cm. The growth process went well until the average plant height reached 78.11 cm - 84.56. cm.

Number of Leaves

Results analyze variety shows that dose treatment fertilizer KCL has no real influence on all age watch j u m l ah leaves plant to m a t-average amount leaf plant tomato on various KCL fertilizer doses are presented in Tab e l 2.

Table 2. Average Number of Tomato Leaves (cm) in the KCL Dose Treatment Age 7, 14,21,28 and 35 HST,

KCL dosage (g/plant)	Number of Leaves (Strands)				
	7 hst	14 hst	21 hst	28 hst	35 hst
6	4.22	6.11	9.22	13.22	17.44
7	4.22	5.33	8.89	12.78	16.44
8	4.33	5.78	9.00	13.22	16.56
9	4.44	5.89	9.33	12.89	16.00
10	4.22	5.78	9.44	12.89	15.89
11	4.67	6.22	9.89	13.89	15.89
12	4.33	5.78	8.89	12.33	15.78
BNJ 5%	Mr	Mr	Mr	Mr	Mr

Note: tn- not significantly different, hst= days after planting

In Table 2. The results of analysis of variance in number of leaves were not significantly different between KCL dose treatments. Observations of the number of leaves from 7 days of age to 35 days of planting showed a significant increase in the average per week from 4.22 pieces to 17.44 leaves. The growth process went well until the average number of leaves reached 15.78 – 17.44 leaves.

Age of Flower Appearance

Results an a l i s is variety show that treatment dose fertilizer K C l has no real influence to age appear flower. Average age appear flower plant on various i dose pup K C l dis a j i right on Table 3.

Table 3. Average Age of Emergence Interest in Treatment Dose K C l

KCl dosage	Age Mun c ul Flowers (hst)
6g/plant	29.56
7g/plant	29.78
8g/plant	28.22
9g/plant	28.67
10g/plant	27.78

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11g/plant	28.89
12g/plant	29.44
B N J 5%	Mr

Information : tn= not significantly different from a ; hst= day after ah ta n am

The average flower appearance of tomato plants with a treatment dose of 6 g/plant to 12 g/plant was able to form flowers at the same time, ranging from 27.77 days to 29.78 days. Variations in flower appearance are not statistically significantly different, but visually there are almost 2 different days when tomato flowers appear

Amount of interest

Results analysis of variance shows that the application of fertilizer dose KCL has no real effect there is the number of flowers on tomato plants. Average j u m l ah interest on various doses of KCl fertilizer after being tested with B N J5 % as shown in Table 4.

Table 4. Average Number of Flowers in Fertilizer Dosage Treatment K C l

KCl dosage (g/plant)	Number of Bu n ga/Plants
6g/plant	16.22
7g/plant	11.67
8g/plant	13.78
9g/plant	16.67
10g/plant	20.00
11g/plant	16.67
12g/plant	13.44
B N J 5%	Mr

Explanation : tn = t is not significantly different

In table 4. The number of flowers treated with a KCL dose of 6 g-12 g/plant produced flowers ranging from 11.67 flowers to 20 flowers/plant.

Number of Fruit/Plant and Weight of Fruit/Plant

Results analysis of variance shows that the application of fertilizer dose KCL has no real effect regarding the number of fruits and fruit weight, tomato plants. Average number of fruits and weight of fruit/ plant various doses of K Cl fertilizer are shown in Table 5.

Table 5. Average Number of Fruit/Plant and Total Weight of Tomato Fruit/Plant in the KCL Fertilizer Dose treatment.

KCL dose 9g/plant)	Number of Fruit/Plant	Fruit Weight g/Plant
6g/plant	5.20	54.88
7g/plant	6.22	60.65
8g/plant	5.20	60.73
9g/plant	6.20	60.40
10g/plant	7.40	69.73
11g/plant	6.40	60.35
12g/plant	7.20	70.73
BNJ 5%	Mr	Mr

Explanation : tn = t is not significantly different

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In Table 5. The application of KCl fertilizer was not significantly different between treatments. Giving 6 g/plant to 12 g/plant can produce a number of flowers ranging from 5.20 to 7.20 flowers.

Discussion

Results research shows on dosing fertilizer K C l various gai ta r a f does not show any influence real on par a meter tall plant and n number m lah leaf . Per t a ddition size tall plants and the number of leaves on ber b a g ai general o bservation No show difference real consequence treat a n dose K C l.

The process of plant growth in the vegetative phase forms higher plant organs, followed by leaf growth. Statistically (ANOVA) giving KCL fertilizer at a dose of 6 g/plant to 12 g/plant did not have a real effect, but visually the tomato plant growth process was running perfectly, but the dose given was unable to show a real difference. This means that at 35 days after planting, the KCL dose of 6-12 g/plant was significantly absorbed by the root hairs of the Tomato plants until the plant reached a plant height of 84.56 cm in the 11 g KCL/plant treatment. and forms 15.89 leaf organs. The ability of tomato plants to absorb KCL during the vegetative period has been clearly proven. This is supported by the statement by Samosir (2018) that the explanation of sufficient potassium elements in plants will make a fish need part of the plant meristem tissue so that the plant height is optimal for its growth. Providing fertilizer with a dose of KCl (6 g/plant) was able to increase plant height from 7 days of observation to 35 days after planting by 69.45%, this value was greater than that obtained with other dosage treatments. Samosir (2018) stated that giving sufficient potassium to plants will increase the size of the plant's meristem tissue so that tall plants will be optimally enjoyed by Mrs. The addition of plant height marks every week at all ages of observation and the levels carried out were K C l fertilization, there was no significant difference. In the vegetative phase, plants tend to require lower quantities of potassium compared to the generative phase. In some cases, a dose of KCl that is too high can inhibit the vegetative growth of plants or plants, causing other problems. The impact of the dose of KCl on the plant phase can vary depending on environmental conditions and the plants being cultivated, right? Each plant a person owns requires different nutrients, and optimal dosages can vary depending on the type of plant, variety, growing medium, and other facts or facts. This is in accordance with the results of Anise Rosy's research (2017) that absorbing greater calcium in tall plants will increase the status of calcium availability in plant organs. It is also good to improve the status of government factories to repair the damage caused by pathogens.

The function of potassium itself is important in relation to the name of the tomato. Potassium plays many roles in the physiological processes of human plants and contributes to productive growth. Potassium helps increase the strength of human plant cells, including those in stems and roots. Plants that get enough calcium can regulate their water balance well, so that I do not reduce the risk of drought or excess water which can damage the roots. Potassium supports the production and placement of carbohydrates in plants. It is useful as a provider of optimal energy and plant growth. Potassium plays a role in opening and closing the stomata and is responsible for gas exchange (carbon dioxide and oxygen)

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and evaporation of air through the stomata. Potassium helps prevent the entry of carbon dioxide and mop up water vapor. Potassium fertilizer will help form proteins, carbohydrates and sugar, as well as help transport sugar from leaves to fruit (M aruli, Ernita and H. Gulto m, 2012). The role of KCL at a dose of 6-12 g/plant has been proven to be able to show an increase in plant height at the age of 28 HST with an increase of between 20 cm-25 cm. , the highest was achieved at a KCL dose of 7 g/plant. (Figure 1.)

Figure 1. Increase in height (cm) of tomato plants per week

The results of the study showed that administration of various levels of KCL fertilizer did not show a significant effect on plant height parameters and the number of leaves. Per t additional signs of plant height parameters in various general observations Does not show differences in real effects of treatment n dose K C l. Judging from the increase in safety increases each week, it can be seen in Table 4.5. Increasing plant height every Sunday for tomato plants is one form of response to giving a dose of K C l fertilizer.

Based on the results of research on the material parameters, the sign of the number of leaves at various ages of attention did not show any differences due to the administration of the KCl dose. Judging from the high level of planting, there is an increase every week, as can be seen in Table 4.6. The first fertilization of tall plants every week on tomato plants is one form of response to giving a dose of K C l fertilizer. The application of KCl fertilizer 6 gr/plant was able to increase the number of leaves from the general g observation of 7 DAP to 35 DAP by approximately 13.2 2%, this value was greater than that obtained with other dosage treatments. . Please add a sign for the number of leaves every time, wait for all ages, pay attention and rate the fertilizer dose K C l No significant difference.

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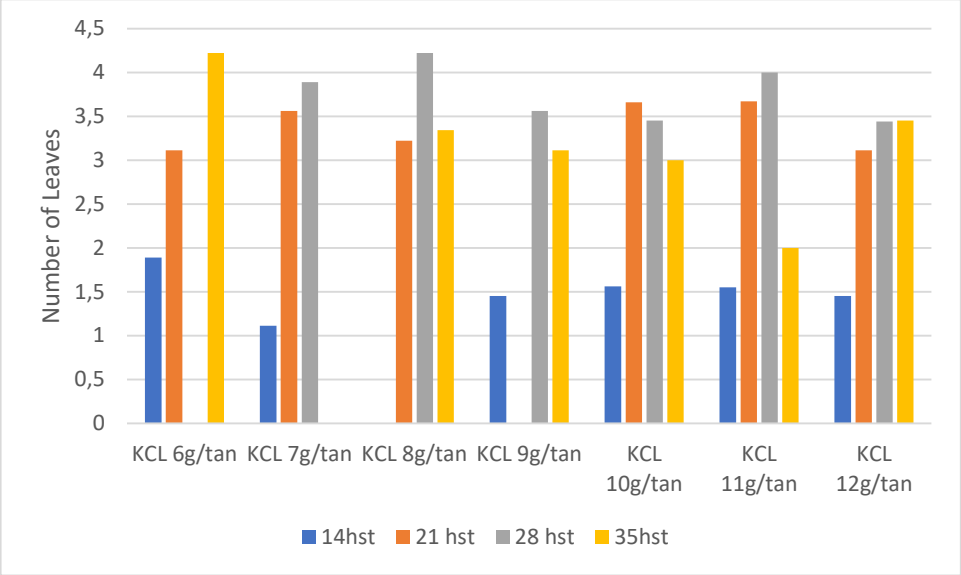

Figure 2. Addition of Number of Leaves Per Week

In figure 2. the number of leaves increases very slowly at 14 days after planting with a dose of 6-12 g KCL/plant, then at 28 days after giving 8 g KCL/plant the increase in the number of leaves continues to increase. Plants need potassium as an essential ingredient in nuts for their functions, including leaf development. However, if the plant or growing media already contains sufficient amounts of potassium, provide an additional dose of KCL. It is unlikely to provide significant benefits to the number of leaves. Plants may already have sufficient potassium supplies to develop an optimal number of leaves. In the vege planting phase, managed plants require a lower amount of potassium compared to the generation phase. This is in accordance with the statement of Barra clou ngh and Hayn es in Erw i yono (2006) that the higher the dose of potassium fertilizer given does not result in a real difference in the menu, giving potassium fertilizer which also causes many other nutrients to appear. availability is limited compared to river fertilizers in general

Based on the results per meter of flower emergence, the results were not significantly different from the various levels of KCl fertilizer doses tested on fish. Providing KCl fertilizer at the right time can influence the time when flower shoots appear on plants, namely when the plants begin to enter the generative phase. The data in table 4.3 can be calculated from the age at which flowers appear. What occurred in the treatment with a KCl fertilizer dose of 10 g/plant was obtained on average 27. 78 DAP And the age at which flowers appeared at a fertilizer dose of K C l 7g/plant was obtained on average 29.78 DAP. According to the V arie bag Servos F1 tomato plant rip table, the age at which flowers appear is 30 -33 days after planting, which shows that the research results show that flowers at this age appear faster than the description. This difference in age is also large thanks to the plant's fast genes. Because the general way of flowering is caused by the loss of gene similarity which affects the environment very low in the number of samples which is its characteristic. Environmental influences will arise if a plant is in a captured state so that the plant will flower earlier. The difference in flowering age is related to the ionic function in stimulating plant growth. Mc Kenzie (2001) stated that in plants it will help

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the photo synthesis process and stimulate plant growth at the beginning of growth and. The existence of a good influence on the generative phase of tomato plants can be influenced by several factors, including suitability to the plant's needs. Apart from that, there is also a nutritional element, especially if the quantity is met, which is one of the factors that supports the fa generation of mouse plants. Potassium (K) is a nutrient that plays a role in meeting sugar needs for plant growth and development, including flower development. This is supported by the statement from Maruli, Ernita and H. Gultom (2012) that with good physical, chemical and biological soil conditions, the absorption of macro and micro nutrients provided through fertilization will be well prepared, so that raw cayenne pepper plants do not require sufficient nutrients to carry out the flowering process.

Based on the results of research on the number of flowers parameter, the results were not significantly different, but the average results obtained in the treatment dose of KCl was 10g/plant with the number of flowers reaching 2 0.00 flowers, which was able to increase the number of flowers by 3.33%. compared with the performance carried out, namely K C l 9 g/plant with a number of flowers of 16.67 flowers, and experienced a decrease in the number of flowers of 3.33% when applying a dose of 11g/plant. This is thought to be the dose achieved by the plant when given the treatment dose of K C l fertilizer. This also shows that the increasing dose of KCl does not determine the number of flowers on future generative plants. Providing KCl with increasingly higher doses up to a certain limit, namely 10 g/plant, will cause the availability of the K element in the land to increase in number of people, so that it will not play a role in other nutrients. The application of KCL fertilizer to the number of fruits and weight of tomatoes was not significantly different between treatments. The yield of tomato plants is very low, reaching 5 to 7 fruits/plant with fruit weights of 54.88 g/plant to 70.73 g/plant respectively.

Providing the right dose of KCl in the negative plant phase can help optimize calcium accumulation in plant tissue. The presence of sufficient potassium m in a plant can influence the production of hormones involved in flower initiation and development, such as the ti hormone in cytokines in n. Potassium acts in the synthesis and stimulation of plant hormones, including hormones involved in flower formation and development. Providing the right dose of KCl can stimulate the production of hormones in the cytok in n which accelerate flower development. This is in accordance with the statement of Cahyono and Ismail in Handayani (2006) stating that in this relationship it is a driving force for the formation of carbohydrates, potassium in K N O 3 is very necessary for the effective reproductive phase of plants and. Produces higher quality flower and fruit bags, due to the perfect formation of sugar.

Wiryan ke (2004) stated that growth and production make humans dependent on the influence of facts or temperature which greatly influence physiological processes. Temperatures between 2 4 -28 0 C are the ideal temperature for the needs and production of tomato plants. Meanwhile, the flowering process of t o mat plants is only carried out at afternoon temperatures of around 1 5 -20 0 C. However, the results of observations of environmental temperature parameters from 1 pm to 35 am could not find the highest daily average temperature with a mark of 33.2 5 0 C , 32.25 0 C, 32.2 5 0 C, and 32.25 0 C were

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obtained at 1 DAP, 3 DAP, 31 DAP, 33 DAP (figure 4.1 and figure 4.5). The lowest daily average temperatures were marked at 2 8 0 C and 28 .5 0 C at 21 HST and 29 HST (figure 4.3 and figure 4.5). The average daily temperature during gamification was 30.83 0 C. Temperature itself has a significant influence on vegetable growth. Optimal temperatures can increase enzyme activity and plant metabolism, whereas temperatures that are too low or too high can inhibit enzyme activity and disrupt the plant growth process. The appropriate temperature will stimulate faster cell division, increasing the growth of leaves, stems and roots. Environmental temperature affects the processes that occur in plants, where plants use solar energy to convert carbon dioxide into glucose and oxygen. Environmental temperature is influenced by the intensity of light received by plants. Environmental temperature has a significant influence on the rate of photosynthesis in plants. Photoscience is the process by which plants use sunlight energy to convert carbon dioxide (CO 2) and water (H2O) into glucose (C 6 H 2 O 6) and oxygen (O2). Increased temperature causes damage to water evaporation rates or increased transpiration in plants and mats. menu pressure t urge r. High temperatures can cause damage to cell membranes which can disrupt water balance and suppress turgor in cells. High levels of light intensity cause an increase in temperature around the plant due to the absorption of light energy. Where higher temperatures can increase the reaction rate and metabolism in plants.

The effect of temperature on the appearance of flowers is very significant in the life cycle of plants. Temperature plays a role in regulating various physical process activities in plant soil, including flowering. Temperature has a big influence on plant growth. At this optimal temperature, plants will grow well and reach the reproductive phase more quickly. According to Anwar (2016) the temperature of tomato plants ranges between 24 0 - 28 0 C. Temperature can affect photoperiod in no way directly because day length and temperature tend to be correlated. Extreme temperatures, both hot and cold, can cause stress in plants. Heat stress can disrupt the flower development process and cause premature flower drop, while cold stress can inhibit flowering or damage the growth of flowers that have already formed.

CONCLUSION

Per l admit various i dose of KCl fertilizer has no influence on high growth plant And amount leaves, when flowers appear, number of flowers, number of fruit and fruit weight of ServoF1 variety tomatoes. KCL dose 10g/ plant give enhancement before 0.89 % to age appear flower And enhancement big 3.33% in terms of the number of flowers compared to the recommended dose of 9 g / plant. Further studies regarding further needs regarding the growth and production of tomatoes in polybags by simultaneously increasing the KCL dosage level per polybag.

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