THESIS

PERLAKUAN PUPUK DAN KAPUR TERHADAP PERTUMBUHAN DAN HASIL BEBERAPA GALUR CABAI MERAH (Capsicum annuum L.) DI LAHAN GAMBUT

FERTILIZER AND LIME TREATMENTS ON GROWTH AND YIELD OF SEVERAL LINES OF RED CHILLI (Capsicum annuum L.) IN PEATLAND

Gusti Putra Wijaya

05091281722027

AGRONOMY STUDY PROGRAM

AGRICULTURAL CULTIVATION DEPARTMENT

FACULTY OF AGRICULTURE SRIWIJAYA UNIVERSITY

2020

SUMMARY

GUSTI PUTRA WIJAYA. Fertilizer and Lime Treatments on Growth and Yield of Several Lines of Red Chilli (*Capsicum annuum* L.) in Peatland (**Supervised** by **SUSILAWATI** and **IRMAWATI**).

This research was aimed to identify growth and optimum yield of several chili as criteria selection tolerant in peatland with fertilizer and lime treatments. The research was conducted from October 2020 to January 2021 in peatland at Tanjung Beringin village, Tanjung Lubuk district, Ogan Komering Ilir, Sumatera Selatan province. This study used a split plot design with fertilizer and lime as the main plots (P_0 = no dolomite lime and no chicken manure; P_1 = 3 kg dolomite lime per plot; P_2 = 3 kg dolomite lime per plot and 3 kg chicken manure per plot), while the sub-plots were three types of IPB chili lines (Line 01 = F10120005-141- 16-35-1-3; Line 03 = F10120005-141-16-35-7-1 and Line 08 = F6074136-2-3). Each experimental unit was repeated 3 times, so there were 27 experimental units. The research data were analyzed using ANOVA and followed by 5% LSD test. The variables observed were plant height, number of leaves, canopy diameter, leaf area, days to flowering, days to harvest, number of fruits per plant, total fruit weight per plot and estimated production per hectare. The results showed that Line 03 was the best line planted in peatland in the P_2 treatment (3 kg of dolomite lime per plot and 3 kg of chicken manure per plot) with an estimated productionof 1,667 tons/ha.

Keywords: *Red Chili, Peatland, Fertilizer and Lime*

APPROVAL SHEET

FERTILIZER AND LIME TREATMENTS ON GROWTH AND YIELD OF SEVERAL LINES OF RED CHILLI (Capsicum annuum L.) IN PEATLAND

THESIS

This thesis was written to fulfill one of the requirements to accomplish a Bachelor's Degree in Agriculture at the Faculty of Agriculture, Sriwijaya University

By

Gusti Putra Wijaya
05091281722027

Indralaya, September 2021

Advisor I	**Advisor II**
Dr. Susilawati, S.P., M.Si.	**Dr. Irmawati, S.P., M.Si., M.Sc.**
NIP. 196712081995032001	**NIP. 19671036009830005**

Certified by,

Dean of the Faculty of Agriculture

Dr. Ir. A. Muslim, M. Agr.
NIP. 1964122919900110

The thesis entitled title Fertilizer and Lime Treatments on Growth and Yield of Several Lines of Red Chilli (*Capsicum annuum* L.) in Peatland had been examined and defended before the Examination Commission Thesis of The Faculty of Agriculture, Sriwijaya University on August 6th , 2021 and had been revised based on the suggestions of the examiners.

Examination Committee

1. Dr. Susilawati, S.P., M.Si. NIP. 196712081995032001	Chairperson	( )
2. Dr. Irmawati, S.P., M.Si., M.Sc. NIP. 19671036009830005	Secretary	( )
3. Dr. Ir. Muhammad Ammar, M.P. NIP. 195711151987031010	Member	( )

Indralaya, September 2021

Head of Department of Agricultural Cultivation	Head of Agronomy Study Program
Dr.Ir.Firdaus Sulaiman, M.Si.	Dr. Ir. Yakup, M.Si.
NIP. 195908201986021001	NIP.196211211987031001

INTEGRITY STATEMENT

The undersigned below:

Name : Gusti Putra Wijaya

Student Number : 05091281722027

Title : Fertilizer and Lime Treatments on Growth and Yield of Several Lines of Red Chilli (*Capsicum annuum* L.) in Peatland

Declare that all data and information contained in this thesis are the result of my own research activities under the supervision of my advisors, unless the sources are clearly mentioned. If in the future found any element of plagiarism in this thesis, then I am willing to accept academic sanctions from Sriwijaya University.

Thus, I make this statement consciously and without coercion from any party.

Indralaya, September 14th, 2021

Gusti Putra Jaya

BIOGRAPHY

Gusti Putra Wijaya, who is fondly called Gusti, was born in Palembang City, August 3, 1999. The writer is the youngest child of Mr. M. Ali Idris, S.Sos and Mrs. Sudarti. The writer has 2 sisters, Lusi Ulan Sari, S.P and Tri Agustin. The writer's family currently lives in the Griya Sukajadi Permai II Block I Complex No. 9 KM 14 Banyuasin. He was a student of the Department of Agricultural Cultivation, class 2017 at Agronomy Study Program. The writer was a graduate of SMA Negeri 21 Palembang. Previously, he studied at SMP Negeri 51 Palembang, SD Negeri 12 Talang Kelapa and TK Kartisa Sukajadi.

Praise to Allah SWT, during his study, the writer was a member of the UNSRI Agronomy Student Association (HIMAGRON), agent BO KURMA FP UNSRI, and pioneered the UNSRI Agronomy Work House Scholarship (RPA). The writer held the position of Secretary to the Manager of the COMDEV Ambassador (Community Development) BO KURMA FP UNSRI. Hopefully with all the writer experience in organization it is able to make the writer to be a better and responsible person in the future. Amen.

ACKNOWLEDGEMENT

All gratitude to Allah SWT who has given His grace and mercy to the writer so that he can complete step by step in writing a thesis entitled Fertilizer and Lime Treatments on Growth and Yield of Several Lines of Red Chilli (*Capsicum annuum* L.) in Peatland. Futhermore, Shalawat are always poured out to our Prophet Muhammad SAW. May we get his intercession in the hereafter.

This thesis was written as one of the requirements for obtaining a Bachelor of Agriculture degree at the Department of Agricultural Cultivation, Faculty of Agriculture, Sriwijaya University. On this occasion, the writer would like to thank Dr. Susilawati, S.P., M.Sc. as supervisor 1, Mrs. Dr. Irmawati, S.P., M.Sc., M.Sc. as supervisor 2, and Mr. Dr. Ir. Muhammad Ammar, M.P. and Mrs. Dr. Ir. Maria Fitriana, M.Sc. as the examiner for all his willingness and sincerity in providing direction and guidance so that the writer can complete the writing of this thesis. The writer also gives thanks to all of his friends in Agronomy class 2017 for their help and support so far, especially to my beloved father M. Ali Idris and Mrs. Sudarti and his beloved sisters, Lusi Ulan Sari and Tri Agustin for their support and prayers which is always given.

The writer realizes that there were still many mistakes and shortcomings in the preparation of this thesis. Therefore, suggestions and constructive input from the readers are very much expected for the perfection of the preparation of this thesis. The writer hopes that this thesis can be useful for the readers. Finally, the writer says thank you.

Indralaya, September 2021

Writer

CONTENTS

Page

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1
INTRODUCTION

1.1. Background

Chili (Capsicum annuum L.) is one of the leading vegetable horticulture commodities which is very important and has high economic value. This commodity has a specific color, taste, and aroma, so it is widely used in daily needs by the community as a spice and cooking spice. Based on data from the Central Statistics Agency and the Directorate General of Horticulture (2020), the chili harvested area in Indonesia in 2019 reached 133,434 ha with a productivity of 9.10 tons/ha, while the chili harvested area in South Sumatra Province was 5,185 ha with a productivity of 7.81 tons/ha. This productivity was still lower than the potential for chili which could reach 17-21 tons/ha (Bahar and Nugrahaeni, 2008).

The cause of the low productivity of chili in South Sumatra is that the existing agricultural land is mostly sub-optimal land. Sub-optimal land itself is less profitable for horticultural cultivation. South Sumatra is the second province with the largest peatland on the island of Sumatra after Riau, which is 1,262,385 ha (Ritung et.al., 2011). The location of the distribution of peatland is on the East Coast of South Sumatra, starting from Ogan Komering Ilir (OKI), Banyuasin, Musi Banyuasin and including Ogan Ilir Regency (OI).

Peatland is land that originates from the formation of peat and the vegetation on it, which is formed in areas with low topography, and has high rainfall or in areas with very low temperatures (Pangaribuan, 2017). As a natural resource, peat has uses for agricultural and forestry cultivation, as aquaculture, which can be used as a nursery medium, soil amelioration and to absorb environmental pollutants (Osaki, 2016). In addition to its large area, peat is a potential area for development, especially for vegetable crops (Kristijono, 2003). Planting vegetables such as chili on peatlands has not been widely carried out because there has been no discovery of superior chili varieties on peatlands (Wibowo et.al., 2016). In addition, the use of peatland for plant cultivation remains problems, including relatively high soil acidity with a pH range of 3-4 and toxicity of Al, Fe and Mn (Agus and Subiksa, 2008). This condition is very unfavorable to the availability of macro and micro nutrients for plants. Efforts to overcome soil acidity and deficiency can be done by liming or fertilizing.

Fertilization is one of the essential plant maintenance activities to get optimal growth. Chicken manure is an alternative to add nutrients and add microorganisms that decompose organic matter, so that it can improve the chemical and biological properties of the soil (Simanungkalit et al., 2012). Very acidic peat soil conditions will cause macro and

micro nutrient deficiencies. According to Wijoyo (2009), it is best to use lime dolomite (CaCO3MgCO3) because in addition to neutralizing soil pH, it also contains calcium (Ca) nutrients.

The most important thing that must be carried out is assembling superior varieties of chili plants through a plant breeding process to produce new cultivars that are able to grow and adapt well on peatlands. Generally, plant breeding is carried out through hybridization followed by selection. The more genetic diversity, the greater the opportunity to get superior varieties will be. One way to obtain genetic diversity in a plant population is through outcrosses between pure lines which are carried out to form cross combinations that have superior properties (Wibowo et.al., 2016). Before the release of the variety, an evaluation is needed which aims to determine the benefits and characteristics of the cross.

Through this research, we will see the growth and yield of several chili lines planted on peat land, so that it is hoped to get the best lines that can adapt and produce high production. The chili seeds came from the results of Plant Breeding Faperta IPB.

1.2. Objectives

This study aimed to determine the optimal growth and yield of several chili lines as selection criteria for tolerance in peatlands with fertilizer and lime treatment.

1.3. Hypothesis

It was assumed that from several tested lines, there were lines with the best adaptation level indicated by good growth and high yield.

CHAPTER 2
LITERATURE REVIEW

2.1. Chili Plant Botany and Morphology

Chili plants (Capsicum annuum L.) originate from the tropical and subtropical world of the Americas, especially Colombia, South America, and continue to spread to Latin America. The spread of chili throughout the world including countries in Asia such as Indonesia was carried out by Spanish and Portuguese traders (Harpenas and Dermawan, 2010).

Chili is an important horticultural crop and is widely cultivated in Indonesia. Setiadi (2006) said chili is a herbaceous plant from the eggplant family (Solanaceae). The classification of chili plants according to Agromedia (2008) is as follows:

Division : Spermatophyta

Subdivisio : Angiospermae

Class : Dicotyledone

Family: Solanaceae

Genus: Capsicum

Species: Capsicum annuum L.

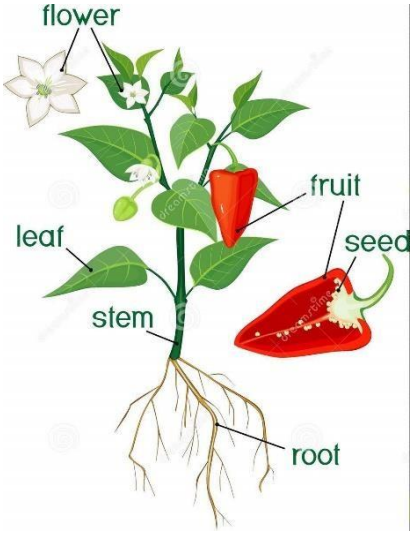


Figure 2.1 Chili Plant Morphology
Source : http://www.dreamstine.com/

Chili is classified as an annual or short-lived plant that grows upright with woody stems and has branches. Chili plants are plants that are easy to grow in the lowlands and in the highlands. Chili plant height can reach 150 cm and the diameter of the canopy reaches 90 cm. Like other plants, chili plants also have plant parts such as roots, stems, leaves, flowers, fruits and seeds.

The root structure of chili begins with a very strong taproot which branches to the side with hair roots (Kusandriani, 1996). The roots of the chili plant grow perpendicular to the ground, functioning as a tree support that has a depth of approximately 200 cm which is brown. From the taproot grows branch roots, then the branch roots grow horizontally in the soil, after that from the branch roots grow fibrous roots that are small and form a dense mass (Tjahjadi, 2010). Meanwhile, according to Prajnanta (2007), a taprooted chili plant consisting of the main root (primary) and the lateral root (secondary) from the lateral root will produce root fibers. Primary root length ranges from 35-50 cm, lateral roots then spread about 35-45 cm.

The main stem of chili is erect and the base is woody with a length of 20-28 cm with a diameter of 1.5-2.5 cm. Branching stems have a length of 5-7 cm and a diameter of 0.5-1 cm. Branching is dichotomous or forging where the growth of regular branches is continuous (Hewindati, 2006). The main stem is greenish brown and the formation of wood on the main stem begins after the plant is 30 days after planting (DAT). The increase in branch length is caused by the continuous growth of axillary buds. Secondary branches will form tertiary branches and continuously form another branch again. In the end there are approximately 7-15 branches per plant (depending on the variety) when calculated from the beginning of branching to flowering stage I. If the plant is still healthy and maintained until the formation of flowers in stage II the branching can reach 21-23 branches (Prajnanta, 2007).

Chili leaves vary greatly according to the type of species and varieties. According to Hewindati (2006), chili leaves are oval in shape with a tapered tip or termed oblongus acutus, pinnate leaf bones equipped with leaf veins. Leaf length ranges from 9-15 cm with a width of 3.5-5 cm. In addition, chili leaves are single leaves, stems with a length of 0.5-2.5 cm, and are spread out. The leaf bones are pinnate and the color of chili leaves varies depending on the variety, generally green or dark green.

According to Wiryanta (2002) chili flowers are shaped like a trumpet, the same as flowers in other solanaceae. Chili flowers are complete flowers consisting of petals, corolla, stamens and pistils. Male genitalia (stamens) and female genitalia (pistil) in chili are located in one flower, so they are called bisexual (hermaphrodites). Chili flowers usually hang consisting of 6 greenish petals and 5 white corollas. Flowers come out of leaf axils (Prajnanta, 2007).

According to Djarwaningsih (2005), the fruit of the chili plant is conical in shape, straight or bent, tapered at the end, hanging, shiny smooth surface, 1-2 cm in diameter, 4-17 cm long, short-stemmed, and has a spicy taste. The young fruit is dark green. Then, it

becomes bright red when it is ripening. Meanwhile, the young chili seeds are yellow in color. When old, they become brown, flat, and about 4 mm in diameter.

2.2. Conditions for Chili Plants Growth

Chili plants (Capsicum annuum L.) can live in areas with an altitude of 0 to 1,200 m above sea level. Good soil for planting chili is crumbly or loose, fertile, rich in humus (organic matter), soil pH between 6-7 (Sunaryono and Rismunandar, 2007). The ideal rainfall for chili plants is between 750-1,250 mm per year or evenly throughout the year (Tim Bina Karya Tani, 2008). Rainfall that is too high can cause chili plants to be susceptible to disease, while rainfall that is too low can also inhibit fruit growth. The suitable humidity for growing chilies is between 70%-80%.

In order for optimal growth, chili plants need a minimum of 10-12 hours of sunlight for photosynthesis, flower and fruit formation, and fruit ripening. If the intensity of sunlight needed is not enough, the harvest time of chili will take longer, the stems will be weak, the plants will grow taller and will be susceptible to disease, especially those caused by bacteria and fungi (Wijoyo, 2009). The use of quality seeds is the main requirement to obtain high chili yields. In order to obtain plants with even growth and high yields, the high quality seeds are needed.

2.3. Chili Lines

One way to increase chili productivity is the use of superior varieties produced through breeding programs. According to Syukur et al. (2018), plant breeding is a combination of science and art and technology in assembling a new plant variety that is more useful for the benefit of humans. Plant breeding activities aim to improve and increase the genetic potential of plants in order to obtain new varieties with better yields and quality (Purwati, 1997 in Haice et al. 2013).

Superior varieties or hybrids can be obtained through crosses between pure lines. The targeted superior traits in the plant breeding program include better fruit appearance, high production potential, more resistance to pests and diseases and chili genotypes that are able to adapt well to certain conditions like peatlands (Haice et al. 2013). Crosses between these lines/genotypes will inform the characteristics of the controlling genes as well as the combining power of each line/genotype so that at the final stage of plant breeding activities will produce new varieties that have advantages for inherited traits (Syukur, 2006).).

Based previous research conducted by Inardo et al. (2014), it showed that the genotypes of chili grown on peatlands had good adaptability and yield and showed different growth rates between genotypes. The IPB C19 genotype (big chili) had a high yield potential compared to other genotypes, which was 290.75 grams per plant.

2.4. Peatland

Peat is a wetland ecosystem characterized by the accumulation of organic matter that lasts for a long time. In the classification of peat soils, they are grouped into the order Histosols or previously called Organosols which have different properties and characteristics from other types of mineral soils in general. Histosol parent material is plant and animal remains mixed with mineral layers deposited by alluvial processes during flooding. Peat soils generally have a low soil pH, high CEC (cation exchange capacity), low content of K, Ca, Mg, P and low micronutrient content (Cu, Zn, Mn, B). According to Rismunandar (2003), although direct planting on peatlands is not productive, various manipulations related to the level of acidity and low soil fertility can restore land productivity. Therefore, for plant cultivation on peatland, additional inputs are needed in the form of lime, manure, and inorganic fertilizer (Kristijono, 2003).

2.5. The Role of Dolomite Lime in Peat

Liming is a technology of applying lime to the soil, which is intended to improve the chemical, physical and biological properties of the soil (Soepardi, 1983). Liming is required for soils containing low soil pH or acidic soils. According to Hardjowigeno (1995) generally lime for agriculture is in the form of calcium carbonate (CaCO3 and some in the form of dolomite (CaMg(CO3)2). Dolomite is one of the ameliorants that has the chemical formula CaMg(CO3)2 derived from nature which contains the nutrient magnesium and calcium in the form of flour (Fatmawaty, 2013). Dolomite generally serves to neutralize soil pH, kills several types of fungi or bacteria in the soil, so that it will increase soil fertility (Kartono, 2010). How to use dolomite is to spread it directly on the ground or stirred Djuhariningrum et al. (2004) stated that applying dolomite to peat soil will improve peat soil conditions by: 1) increasing soil pH, 2) reducing the availability of toxic organic compounds, 3) increasing soil fertility, 4) increasing soil elements of Ca and Mg, 5) increasing the availability of nutrients, and 6) improving the life of soil microorganisms, including those in root nodules. If the application of lime exceeds the required soil pH, it will adversely affect the optimum growth of plants because it will be inefficient. Furthermore, the timing and method of liming must also be considered (Leiwakabessy and Sutandi, 1998).

2.6. The Role of Chicken Manure in Peat

Fertilization aims to add nutrients needed by plants. Nutrients naturally found in the soil cannot be fully relied on to stimulate plant growth optimally (Lingga, 1990). Manure is an organic fertilizer derived from solid and liquid manure (urine) of livestock that has been mixed with food scraps (Rosmarkam and Yuwono, 2002). Chicken manure is an organic

fertilizer derived from chicken manure that has been cooked or has been decomposed. It consists of solid and liquid animal manure mixed with food residue and it can add nutrients to the soil. Complete nutrients are needed for plant growth, namely macro nutrients such as nitrogen (N), phosphorus (P), and potassium (K) along with micro nutrients which are also contained in manure. Chicken manure has a positive effect compared to other organic materials in improving the quality of acid soil (Koesrini and Eddy, 2006). Chicken manure can create a better growing medium, more fertile, loose, well aerated so that the nutrients needed by plants for growth such as nitrogen, phosphorus, potassium are in available condition. The addition of manure to the soil can improve soil physical properties in terms of the soil ability in binding water, improving soil fertility, improving soil structure, and stimulating soil microorganism activity (Dalimunthe and Khairul, 2018).

CHAPTER 3
RESEARCH METHODOLOGY

3.1. Place and Time

The research was carried out in the Peatlands of Tanjung Beringin Village, Tanjung Lubuk District, Ogan Komering Ilir with coordinates -3^{0}31'12", 104^{0}41'14" and it was held in October 2020 – January 2021.

3.2. Tools and Materials

The tools used in this study were 1) Stationery, 2) Hoe, 3) Bucket, 4) Camera, 5) Meter, 6) Ruler, 7) pH meter, 8) Machete and 9) Analytical Balance.

The materials used in this research were: 1) Chili Seeds Lines of IPB, 2) Dolomite Lime, 3) Manure, 4) NPK Mutiara 16:16:16 fertilizer, and 5) Polybag.

3.3. Research Method

The method used in this study was the Split plot method with 3 types of IPB Chili Seeds as subplots and 3 treatments of fertilizer and lime as the main plot. This study used 3 replications with 10 plants per unit, so that a total of 270 plants would be produced. The following were the details of the research units that were used, namely:

Main Square = Fertilizer and Lime

P0 = No dolomite and no chicken manure

P1 = 3 kg dolomite per plot (10 tons/ha)

P2 = Dolomite 3 kg per plot (10 tons/ha) and chicken manure 3 kg per plot (10 tons/ha)

Sub-plots = Three Types of IPB Chili Lines

Line 01 = F10120005-141-16-35-1-3

Line 03 = F1012005-141-16-35-1-4

Line 08 = F6074136-2-3

The data obtained were analyzed using the Anova test (Analysis of Variance) with F table, this analysis was carried out by comparing F count. If the calculated F was smaller than the F table 5% then the treatment had no significant effect. If the calculated F was greater than the F table 5% then the treatment had a significant effect and if the calculated F was greater than the F table 1% then the treatment had a very significant effect. If the calculated F was real or very real, then it was continued with the Least Significant Difference (LSD) test at the 5% level.

3.4. Procedures

3.4.1. Seeding

Before sowing, the chili seeds were soaked in plain water for 30 minutes to speed up the germination process. Seeds were sown in polybags with seedling media in the form of top soil and manure mixed with a ratio of 1:1. The nursery was carried out in a place that was not exposed to direct sunlight. Watering was carried out moderately every morning and evening. Before the seedlings were transferred to the field, the seedlings were allowed to receive direct sunlight which aimed to strengthen the chili seedlings.

3.4.2. Land Preparation

The land was prepared 40 days before the seeds were planted, by cleaning them from the remnants of garbage and weeds. The map was made with a length of 3 m, width 1 m, height 50 cm, and the distance between the plots was 50 cm. One week before planting, the impending planted land was treated with chicken manure and dolomite lime according to the treatment. Then, the land was processed so that the soil and manure could be mixed evenly.

3.4.3. Planting

Transfer of seedlings to the field was carried out after 3 weeks of age or had 3-4 leaves, and seedlings were planted by opening polybags without damaging the soil and roots. The spacing used was 60 cm x 60 cm with a triangular pattern and then doused with enough water. The seeds planted were normal and healthy seeds with high uniformity. Planting was carried out in the afternoon so that the seedlings were not stressed.

3.4.4. Maintenance

Plant maintenance included watering, fertilizing, controlling weeds and controlling pests and diseases. Watering was carried out every day, in the morning and evening depending on environmental conditions and soil moisture. Watering used a bucket or hose according to the needs of the chili plant. Fertilization was carried out by giving the basic fertilizer NPK Mutiara 16:16:16 with a dose of 100 grams per plot. Weed control was carried out manually by pulling weeds that grew around the plant. Pest and disease control was carried out manually by cutting the plant parts that were attacked by pests.

3.4.5. Harvest

Harvesting was carried out when the chilies showed a general characteristic of ripeness, which was red. The fruit was harvested by picking directly by hand.

3.5. Parameters

3.5.1. Plant Height (cm)

Measurement of plant height was carried out starting from the base of the stem to the highest growing point using a ruler or meter. The measurements were carried out when the plant was one week after planting until one week before harvesting and the process were carried out once a week.

3.5.2. Number of Leaves per Plant (Strand)

Counting the number of leaves was carried out by counting the addition of each leaf that came out and had opened. Observations were made at the age of the plant one week after planting until the plant had issued its first flower and measurements were made once a week.

3.5.3. Canopy Diameter (cm)

Measurement of canopy diameter was carried out on each sample plant after the first harvest.

3.5.4. Leaf Area (cm2)

Leaf area was measured using the Easy Leaf Area application using a smartphone by making a red comparison paper measuring 2 cm x 2 cm. Leaf area measurements were carried out at the time of the last harvest.

3.5.5. Flowering Age (days)

Flowering age was calculated as the number of days starting from the time of transplanting until 50% of the plant population in the plot had flowered at the time of the first flowering.

3.5.6. Harvest Age (days)

Harvest age was calculated by the number of days starting from the time of transplanting until 50% of the plant population in the plot had produced fruit that was ready to harvest.

3.5.7. Number of Fruits per Plant (fruit)

The number of fruits was calculated based on the production of fruit produced by each plant at harvest.

3.5.8. Total Fruit Weight per Plot (gram)

The total fruit weight per plant was weighed based on the production of fruit produced by each plant on the plot at harvest.

3.5.9. Estimated Production per Hectare (kg/ha)

The formula for calculating the estimated production per hectare was as follows:

$$Estimated\ production\ per\ ha = \frac{\frac{Yield\ per\ plant}{Plant\ distance}\ x\ 10.000\ m^2}{1.000.000\ gram\ (ton)}$$

Description:
Yield per plant = Weight of fruits per plant

CHAPTER 4
RESULTS AND DISCUSSION

4.1. Results

The results of the analysis of variance using the ANOVA test showed that the fertilizer and lime treatment had a significant effect on several observed variables.

Table 4.1 F-count value and coefficient of variance in the treatment of fertilizers and lime, chili lines, and their interactions.

No.	Observed Variable	F Count			CV_p	CV_g
		P	G	P x G	(%)	(%)
1.	Plant height week 1	25,53**	0,33tn	3,83*	7,73	16,80
2.	Plant height week 2	64,12**	0,03tn	5,46**	10,10	16,51
3.	Plant height week 3	9,43*	0,27tn	2,03tn	26,67	22,37
4.	Plant height week 4	14,88*	0,48tn	1,29tn	25,97	29,10
5.	Plant height week 5	12,28*	0,51tn	1,41tn	30,34	26,82
6.	Plant height week 6	7,08*	0,66tn	2,19tn	36,63	25,65
7.	Plant height week 7	4,90tn	0,66tn	2,19tn	43,29	30,51
8.	Plant height week 8	5,04tn	0,90tn	3,22tn	37,85	25,15
9.	Plant height week 9	4,18tn	0,93tn	4,58*	35,14	22,28
10.	Number of leaves week 1	2,94tn	0,19tn	5,31*	26,56	17,62
11.	Number of leaves week 2	14,25*	0,08tn	3,60*	23,39	23,34
12.	Number of leaves week 3	11,88*	0,17tn	1,23tn	43,63	48,85
13.	Number of leaves week 4	18,29**	0,37tn	0,52tn	44,50	51,67
14.	Number of leaves week 5	8,68*	0,34tn	0,73tn	70,62	41,35
15.	Number of leaves week 6	9,16*	0,43tn	0,70tn	67,88	36,75
16.	Canopy diameter	6,72tn	0,82tn	6,45**	46,83	21,84
17.	Leaf area	0,78tn	0,17tn	0,12tn	79,68	70,25
18.	Flowering age	0,45tn	0,20tn	0,84tn	41,50	31,85
19.	Harvest age	0,26tn	1,23tn	0,94tn	37,98	27,88
20.	Number of harvested fruits 1	3,83tn	0,36tn	2,32tn	56,53	57,61
21.	Number of harvested fruits 2	1,71tn	0,13tn	2,33tn	59,28	70,12
22.	Number of harvested fruits 3	1,72tn	0,72tn	1,13tn	81,12	91,80
23.	Number of harvested fruits 4	19,60**	2,04tn	3,20tn	35,15	63,84
24.	Number of harvested fruits 5	6,66tn	0,38tn	0,42tn	52,06	73,60
25.	Total fruit weight at harvest 1	2,19tn	0,46tn	1,13tn	78,19	75,47
26.	Total fruit weight at harvest 2	2,06tn	0,79tn	2,51tn	40,71	79,79
27.	Total fruit weight at harvest 3	2,63tn	1,79tn	1,11tn	70,83	81,82
28.	Total fruit weight at harvest 4	9,33*	2,41tn	5,10*	44,47	45,20

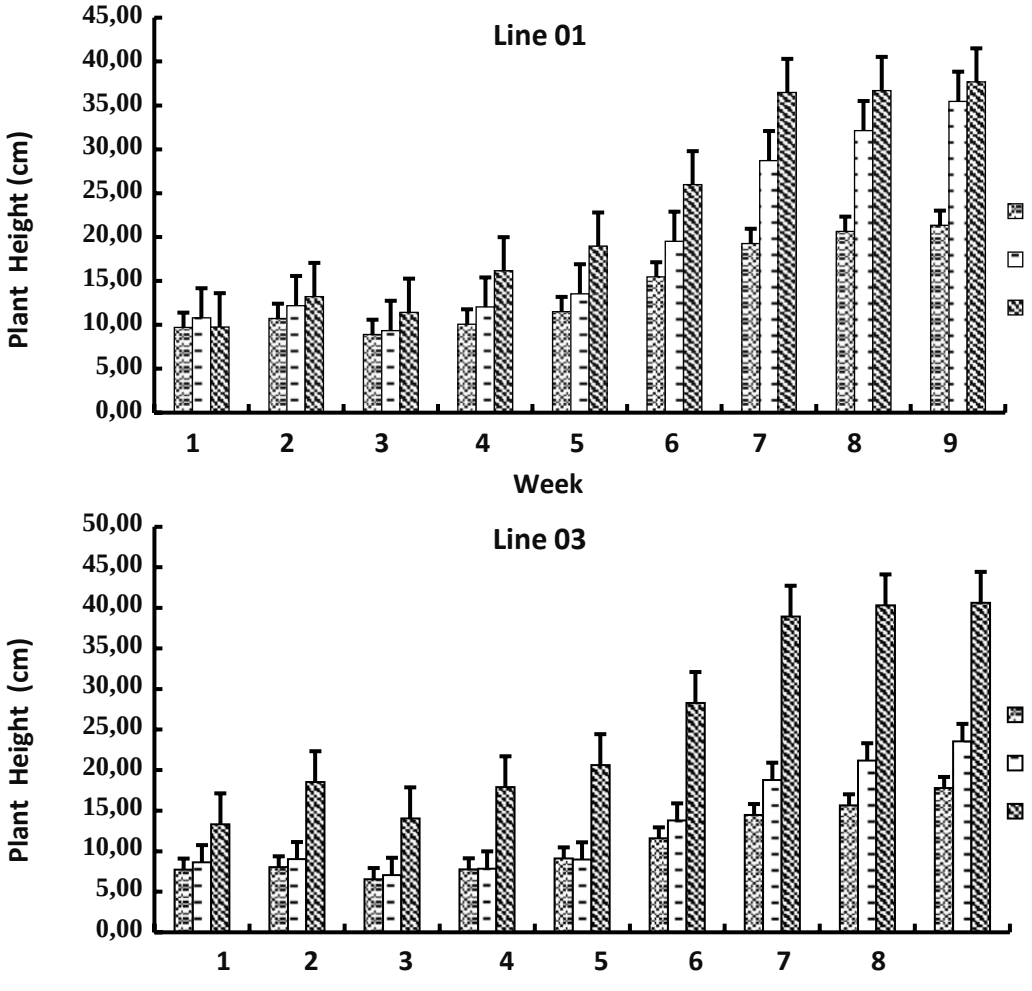
29.	Total fruit weight at harvest 5	3,85tn	0,58tn	0,27tn	78,83	66,96
	F Table 5%	6,94	3,89	3,26		
	F Table 1%	18	6,93	5,41		

Description: CV = Coefficient Variance, ** = Very Significant Effect, * = Significant Effect, ^{tn} = Insignificant Effect

Based on the table above, it showed that the fertilizer and lime treatment had a very significant effect on the parameters of plant height at week 1 and week 2, number of leaves at week 4, and number of fruit harvested in the 4th week and had a significant effect on plant height parameters at week 4.-3 to 6 weeks, the number of leaves at the 2nd week, 3rd week, 5th week, and 6th week, and the total fruit weight of the 4th harvest as the main plot. The results of the study on sub-plots (chili lines) did not significantly affect all observed parameters.

4.1.1. Plant height

The results of the analysis of variance on the tested chili line showed no significant differences in plant height parameters. Chili plants treated with P2 (Figure 4.1) had the highest average plant height compared to P0 and P1 treatments. Line 01 had an average height of 37.67 cm, Line 03 had an average height of 40.63 cm and Line 08 had an average height of 35.60 cm.



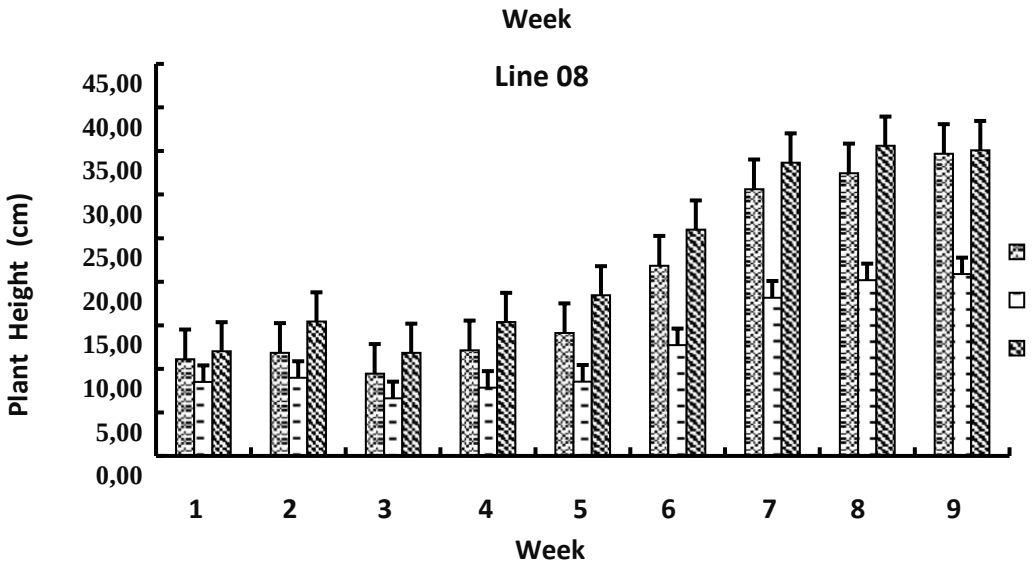


Figure 4.1 Plant height of chili line in peat (P0 = 0 tons/ha chicken manure and 0 tons/ha dolomite lime; P1 = 10 tons/ha dolomite lime; P2 = 10 tons/ha chicken manure an d 10 tons/ha dolomite lime)

The results of the further test of 5% LSD interaction on plant height parameters could be seen in Table 4.2, Table 4.3, and Table 4.4.

Table 4.2 the results of the further test of the interaction of the line treatment (G) with the fertilizer and lime treatment (P) at week 1

Line	Fertilizer and Lime			Mean
	P_0	P_1	P_2	
Line 01	9,7a	10,8b	9,8a	10,09
Line 03	7,7a	8,6a	13,3b	9,90
Line 08	11,1b	8,5a	12b	10,53
Mean	9,51a	9,31a	11,70b	
LSD 5%	P x G = 3,04			

Description: Numbers followed by the same letter in all directions are not significantly different based on the 5% LSD test

Table 4.3 the results of the further test of the interaction of the line treatment (G) with the fertilizer and lime treatment (P) at week 2

Line	Fertilizer and Lime			Mean
	P_0	P_1	P_2	
Line 01	10,7a	12,2b	13,2b	12,06
Line 03	8,0a	9a	18,5c	11,87
Line 08	11,8b	9a	15,4c	12,08
Mean	10,20a	10,07a	15,73b	
LSD5%	P x G = 3,53			

Description: Numbers followed by the same letter in all directions are not significantly different based on the 5% LSD test

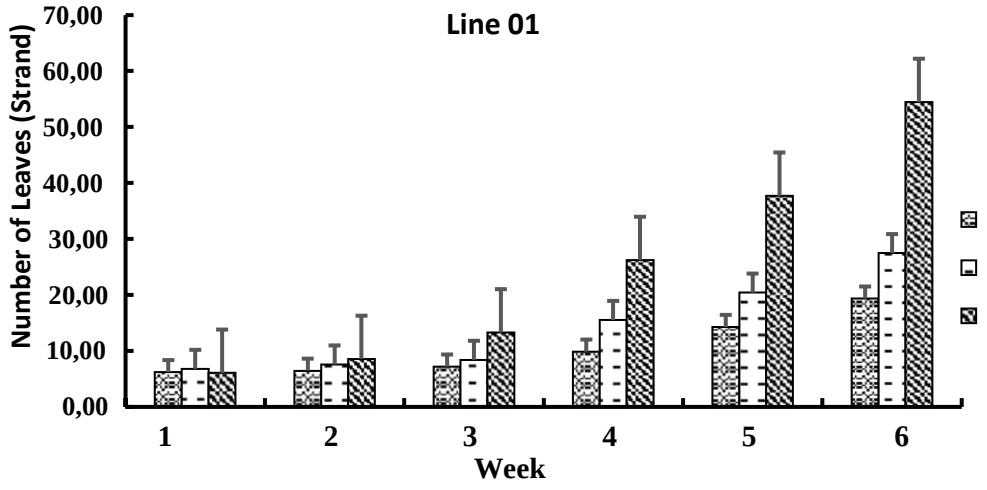
Table 4.4 the results of the further test of the interaction of the line treatment (G) with the fertilizer and lime treatment (P) at week 9

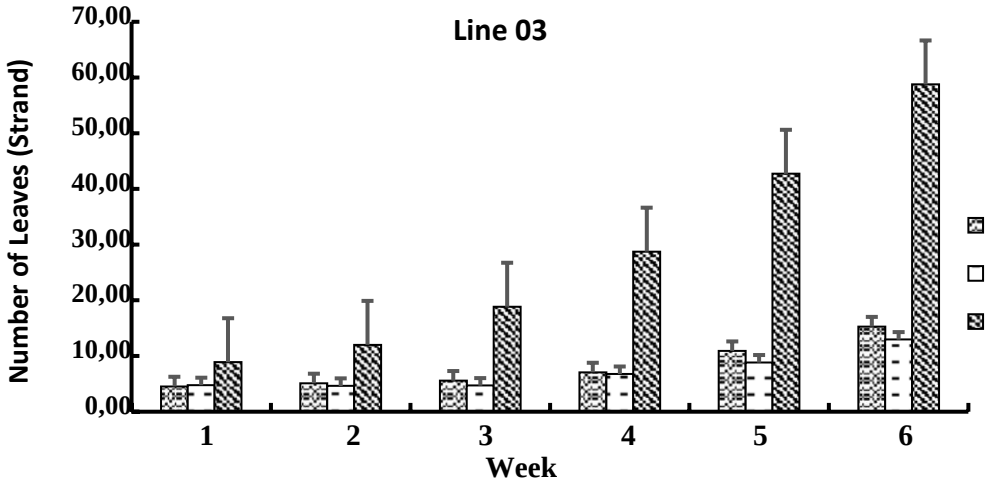
Line	Fertilizer and Lime			Mean
	P_0	P_1	P_2	
Line 01	21,3a	35,5b	37,7b	31,49
Line 03	17,8a	23,6a	40,6b	27,33
Line 08	34,7b	20,9a	35,1b	30,21
Mean	24,60	26,63	37,80	
LSD 5%	P x G = 11,67			

Description: Numbers followed by the same letter in all directions are not significantly different based on the 5% LSD test

4.1.2. Number of Leaves

The results of the analysis of variance on the tested chili line showed no significant difference in the number of leaves parameter. Chili plants treated with P2 (Figure 4.2) had the highest average number of leaves compared to P0 and P1 treatments. Line 01 had an average number of leaves of 54.47 strands, Line 03 had an average number of leaves of 58.77 strands and Line 08 had an average number of leaves of 53.03 strands.





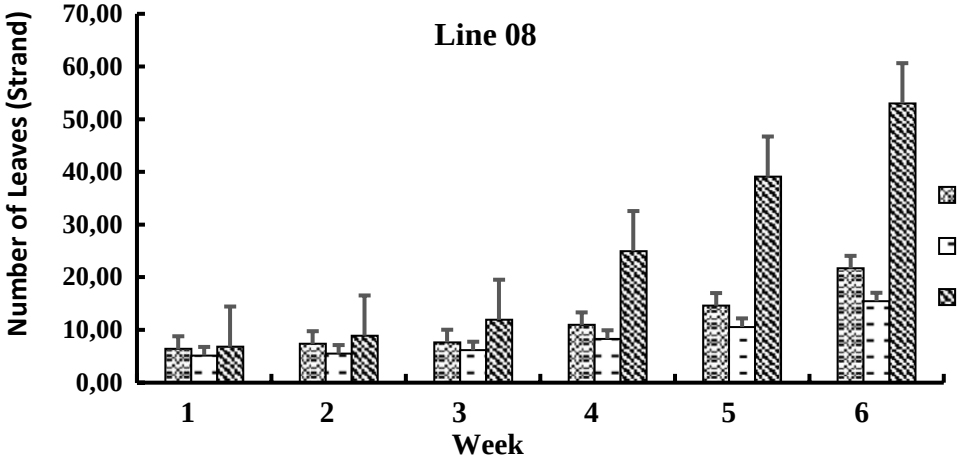


Figure 4.2 Number of leaves of chili line in peat (P0 = 0 tons/ha chicken manure and 0 tons/ha dolomite lime; P1 = 10 tons/ha dolomite lime; P2 = 10 tons/ha chicken manure and 10 tons/ha dolomite lime)

The results of the further test of 5% LSD interaction on number of leaves per plant parameters could be seen in Table 4.5, and Table 4.6.

Table 4.5 the results of the further test of the interaction of the line treatment (G) with the fertilizer and lime treatment (P) at week 1

Line	Fertilizer and Lime			Mean
	P_0	P_1	P_2	
Line 01	6,2a	6,8b	6,1a	6,38
Line 03	4,6a	4,8a	8,9c	6,08
Line 08	6,4a	5,2a	6,8b	6,13
Mean	5,73	5,58	7,28	
LSD 5%	P x G = 1,94			

Description: Numbers followed by the same letter in all directions are not significantly different based on the 5% LSD test

Table 4.6 the results of the further test of the interaction of the line treatment (G) with the fertilizer and lime treatment (P) at week 2

Line	Fertilizer and Lime			Mean
	P_0	P_1	P_2	
Line 01	6,5a	7,6a	8,6b	7,53
Line 03	5,1a	4,6a	12c	7,24
Line 08	7,4a	5,5a	8,9b	7,27
Mean	6,31a	5,90a	9,83b	
LSD 5%	P x G = 3,05			

Description: Numbers followed by the same letter in all directions are not significantly different based on the 5% LSD test

4.1.3. Canopy Diameter

The results of the analysis of variance on the tested chili line showed no significant difference in the diameter of the canopy parameter. Chili plants that were treated with P2 (Figure 4.3) had the highest average canopy diameter compared to treatments P0 and P1. Line 01 had an average canopy diameter of 49.47 cm, Line 03 had an average canopy diameter of 56.07 cm and Line 08 had an average canopy diameter of 47.70 cm.

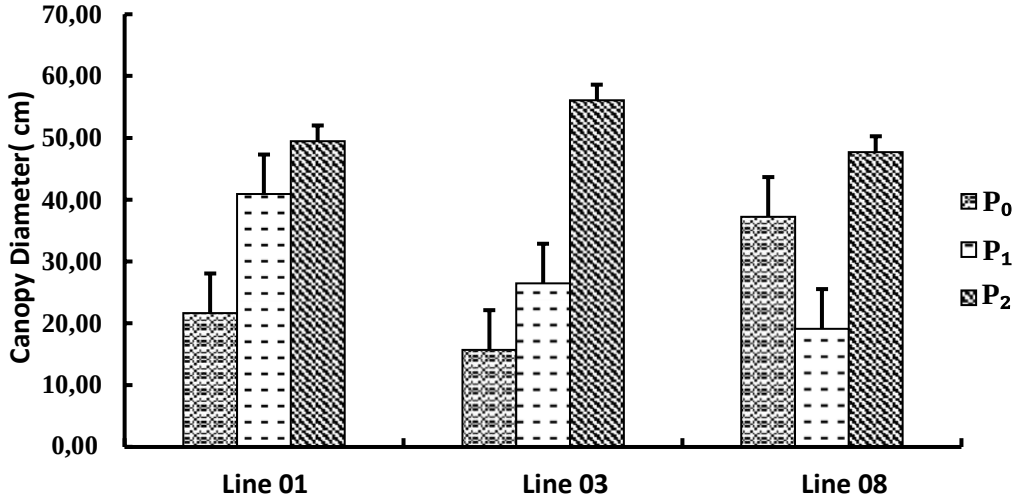


Figure 4.3 Diameter of canopy of chili line in peat (P0 = 0 tons/ha of chicken manure and 0 tons/ha of dolomite lime; P1 = 10 tons/ha of dolomite lime; P2 = 10 tons/ha of chicken manure and 10 tons/ha of dolomite lime)

The results of the further test of 5% LSD interaction on canopy diameter parameters could be seen in Table 4.7.

Table 4.7 the results of the further test of the interaction of the line treatment (G) with the fertilizer and lime treatment (P)

Line	Fertilizer and Lime			Mean
	P_0	P_1	P_2	
Line 01	21,6a	40,9b	49,5b	37,33
Line 03	15,7a	26,5a	56,1c	32,74
Line 08	37,2b	19,1a	47,7b	34,69
Mean	24,86	28,83	51,08	
LSD 5%	P x G = 13,57			

Description: Numbers followed by the same letter in all directions are not significantly different based on the 5% LSD test

4.1.4. Leaf Area

The results of the analysis of variance on the tested chili seed showed no significant difference in the leaf area parameters. Chili plants treated with P1 (Figure 4.4) had the highest average leaf area compared to P0 and P2 treatments. Line 01 had an average leaf area of 167.98 cm2, Line 03 had an average leaf area of 138.17 cm2 and Line 08 had an average leaf area of 134.45 cm2.

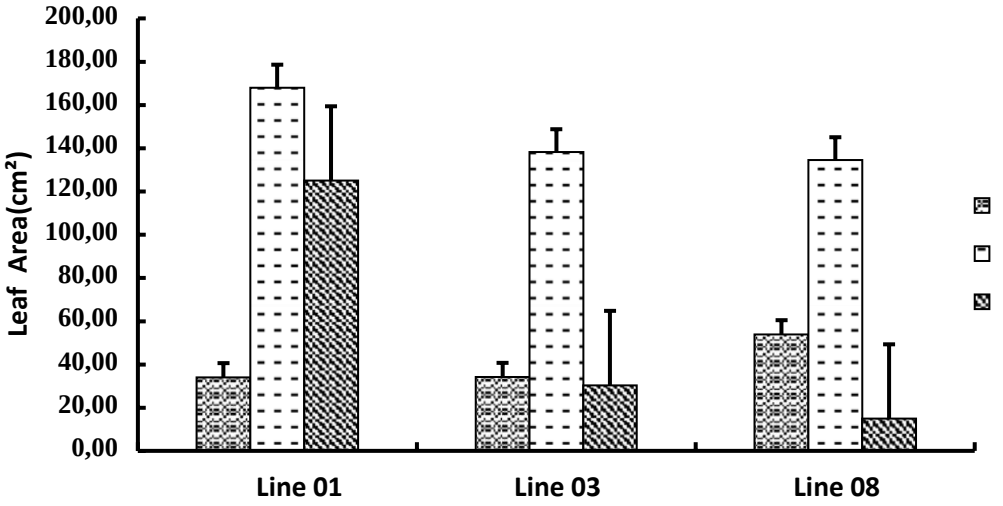


Figure 4.4 Leaf area of chili line in peat (P0 = 0 tons/ha chicken manure and 0 tons/ha dolomite lime; P1 = 10 tons/ha dolomite lime; P2 = 10 tons/ha chicken manure and 10 tons/ha dolomite lime)

4.1.5. Flowering Age

The results of the analysis of variance on the tested chili lines showed no significant difference in the parameters of flowering age. Chili plants treated with P2 (Figure 4.5) had the shortest average flowering age compared to P0 and P1 treatments. Line 01 and Line 03 had the same average flowering age of 35 days and Line 08 had an average flowering age of 39.67 days.

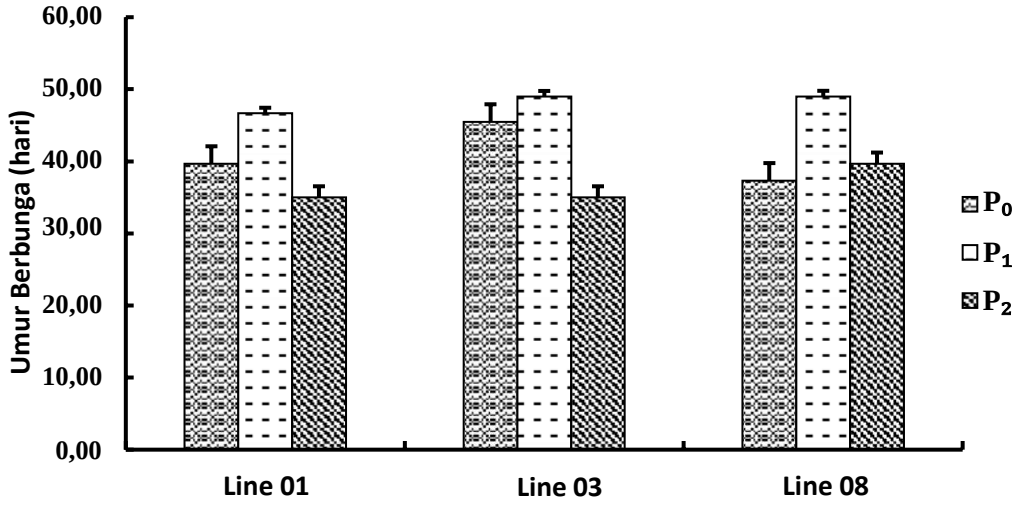


Figure 4.5 Flowering age of chili line in peat (P0 = 0 tons/ha of chicken manure and 0 tons/ha of dolomite lime; P1 = 10 tons/ha of dolomite lime; P2 = 10 tons/ha of chicken manure and 10 tons/ha of dolomite lime)

4.1.6. Harvest Age

The results of the analysis of variance on the tested chili line showed no significant difference in the harvest age parameter. Chili plants that were treated with fertilizer and lime did not show a significant difference (Figure 4.6). Line 01 and Line 03 had a relatively short average harvest age of 76 days and Line 08 had an average harvest age of 78.67 days.

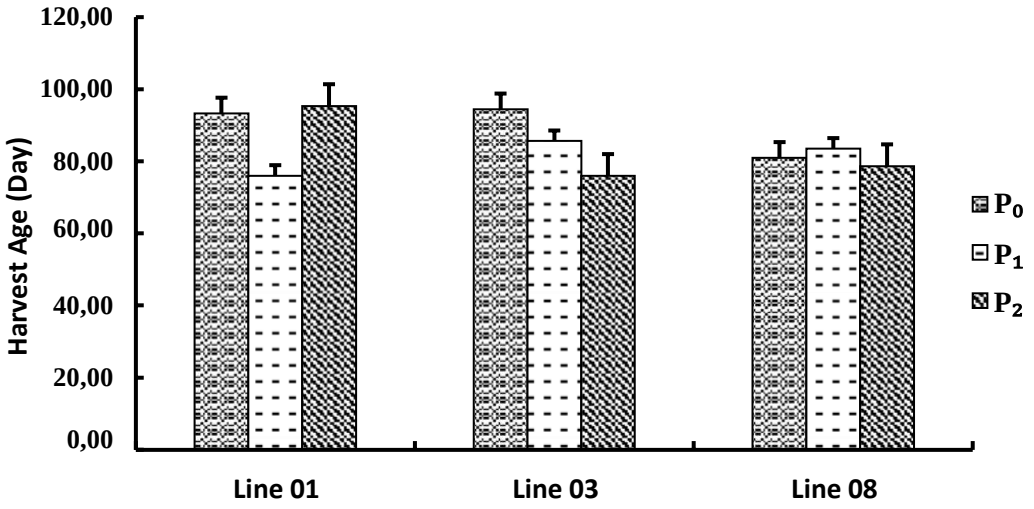
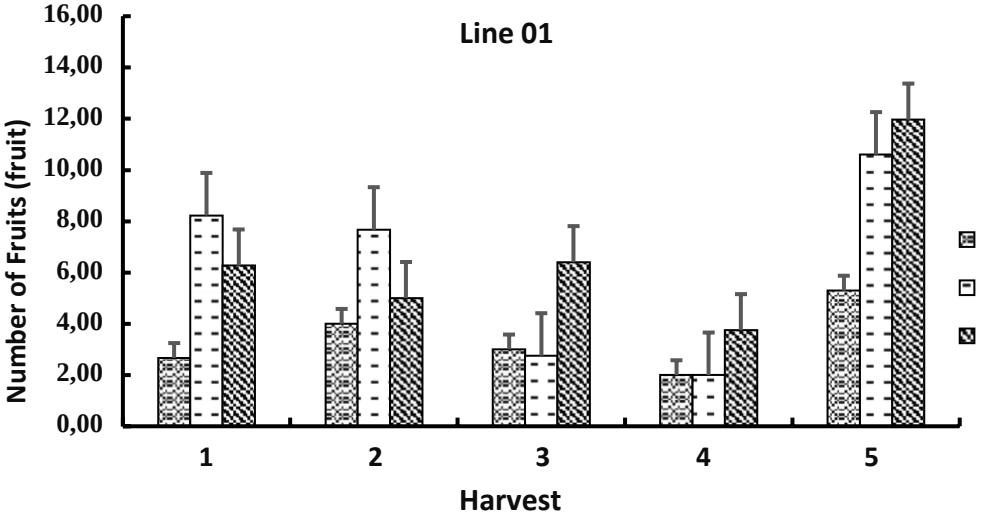


Figure 4.6 Harvest age of chili line in peat (P0 = 0 tons/ha of chicken manure and 0 tons/ha of dolomite lime; P1 = 10 tons/ha of dolomite lime; P2 = 10 tons/ha of chicken manure and 10 tons/ha of dolomite lime)

4.1.7. Number of Fruits

The results of the analysis of variance on the tested chili line showed no significant difference in the number of fruit parameters. Chili plants treated with P2 tended to have a relatively high number of fruits compared to P0 and P1 (Figure 4.7). Line 01 had the highest average number of fruits at 11.97 at the 5th harvest, Line 03 had the highest average number of fruits at 12.53 at the 1st harvest and Line 08 had the highest average number of fruits at 10.50 at the 5th harvest.



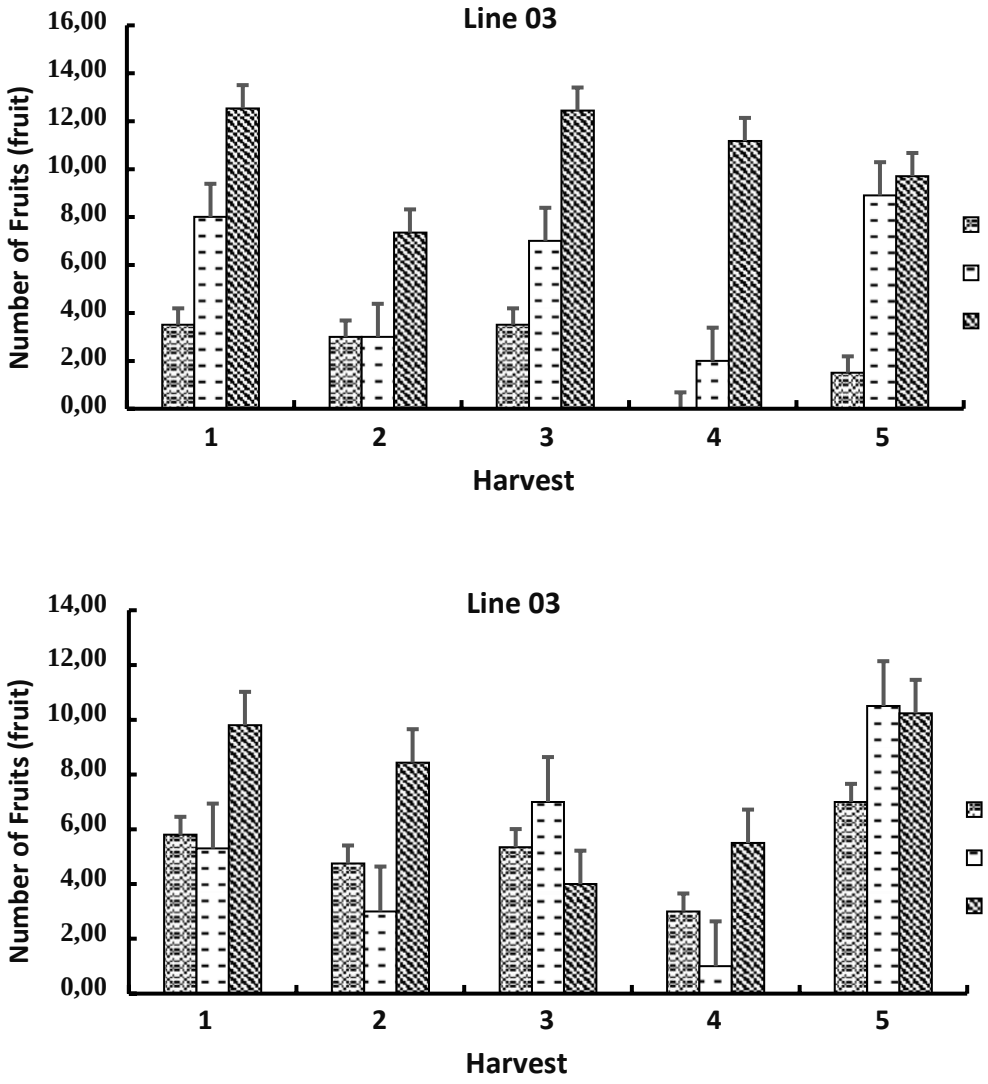


Figure 4.7 Number of fruits of chili line in peat (P0 = 0 tons/ha of chicken manure and 0 tons/ha of dolomite lime; P1 = 10 tons/ha of dolomite lime; P2 = 10 tons/ha of chicken manure and 10 tons/ha of dolomite lime)

4.1.8. Total Fruit Weight

The results of the analysis of variance on the tested chili line showed no significant difference in the total fruit weight parameter. Chili plants treated with P2 tended to have a high total fruit weight compared to P0 and P1 (Figure 4.8). Line 01, Line 03 and Line 08 had the highest total fruit weight at harvest 1 with values of 37.57 grams, 43.63 grams and 32.70 grams.

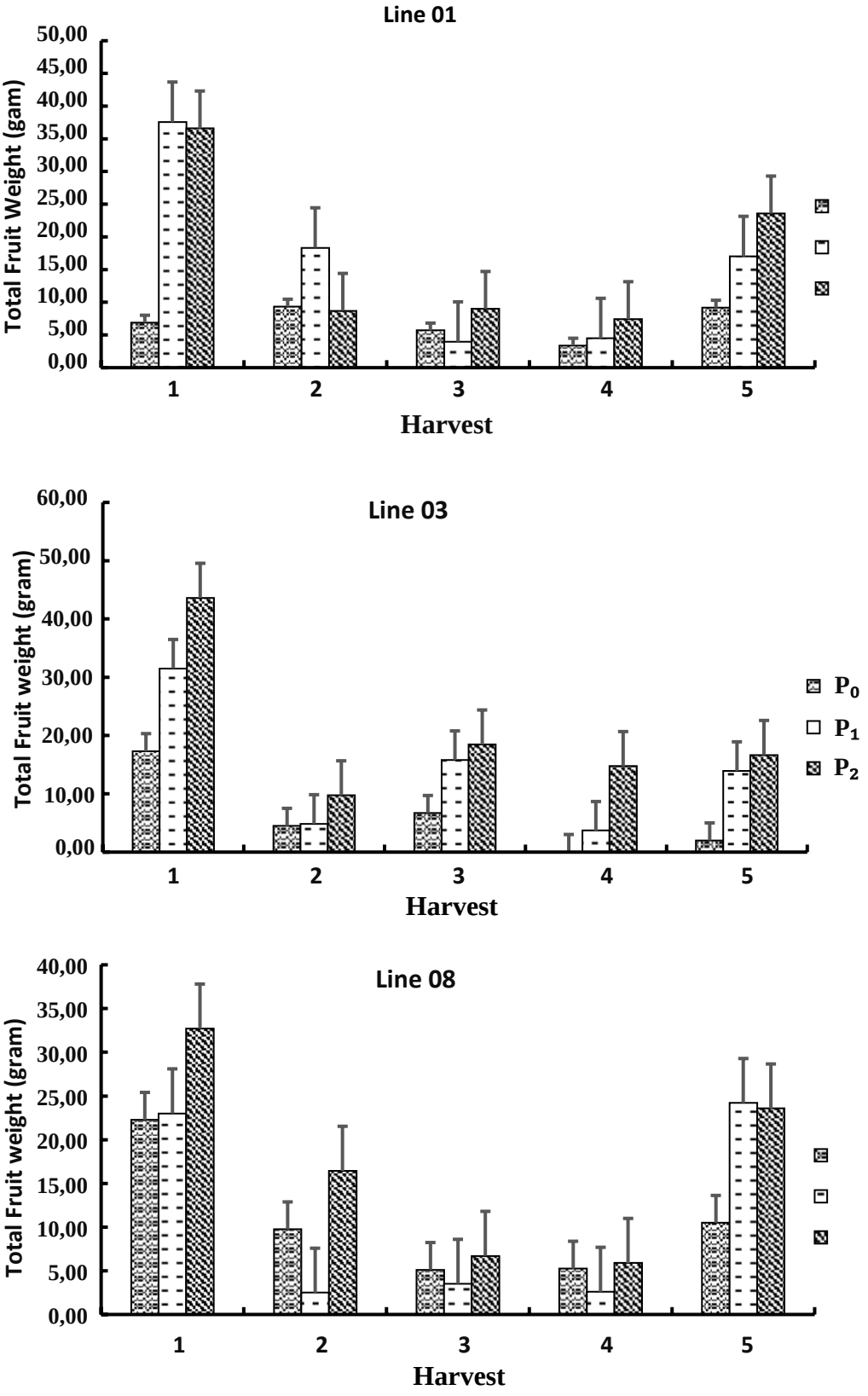


Figure 4.8 Total fruit weight of chili line in peat (P0 = 0 tons/ha of chicken manure and 0 tons/ha of dolomite lime; P1 = 10 tons/ha of dolomite lime; P2 = 10 tons/ha of chicken manure and 10 tons/ha of dolomite lime)

The results of the further test of 5% LSD interaction on total number of fruit per plant parameters could be seen in Table 4.8.

Table 4.8 the results of the further test of the interaction of the line treatment (G) with the fertilizer and lime treatment (P) at the 4th harvest

Line	Fertilizer and Lime			Mean
	P_0	P_1	P_2	
Line 01	1,1a	1,5a	5,0a	2,53
Line 03	0,0a	1,2a	14,8b	5,33
Line 08	3,5a	0,9a	2,0a	2,11
Mean	1,54a	1,20a	7,23b	
LSD 5%	P x G = 6,02			

Description: Numbers followed by the same letter in all directions are not significantly different based on the 5% LSD test

4.1.9. Estimated Production per Hectare (kg/ha)

The formula for calculating the estimated production per hectare was as follows:

$$Estimated\ production\ per\ ha = \frac{\frac{Yield\ per\ plant}{Plant\ distance}\ x\ 10.000\ m^2}{1.000.000\ gram\ (ton)}$$

The following (Table 4.9) was the production of chili as a result of the research:

Table 4.9 Chili production per plant (gram)

Line	Fertilizer and Lime		
	P_0	P_1	P_2
Line 01	11,54	46,24	44,44
Line 03	6,1	24,99	60,02
Line 08	25,6	11,16	39,6

Based on table 4.9, it was found that the highest chili production was in Line 03 with P2 treatment of 60.02 grams. Then, the results were entered into the formula for the estimated production per ha below:

$$Estimated\ production\ per\ ha = \frac{\frac{60{,}02\ gram}{60\ cm\ x\ 60\ cm} x\ 10.000\ m^2}{1.000.000\ gram\ (ton)}$$

$$Estimated\ production\ per\ ha = \frac{1.667.222{,}22}{1.000.000}$$

$$Estimated\ production\ per\ ha = 1.667\ ton/ha$$

The estimated value of chili production per hectare from the results of this study was obtained at 1,667 tons/ha.

4.2. Discussion

The results of the research observations after the analysis of variance showed that the differences in the lines had no significant effect on all of the observed parameters. Fertilizer and lime treatment had a significant effect on plant height parameters at week 3 to week 6, number of leaves at week 2; the 3rd; 5th; 6th; and total fruit weight at the 4th harvest, while the very significant effect on the parameters of plant height was at the 1st and 2nd week, the number of leaves at the 4th week and the number of fruit harvested at week 4.

Based on the results of the average plant height in Figure 1, the plant height in the use of three lines was in the range of 6.63-40.63 cm. The highest mean plant height of Line 01 was in the P0 treatment with a value of 37.67 cm, the highest Plant Strain 03 was in the P2 treatment with a value of 40.63 cm and the highest lineage 08 plant was in the P2 treatment with a value of 35.10 cm. Line 01 tended to have better plant height growth even though it was not significantly different from Line 03 and Line 08. Based on further interaction tests in Tables 4.2, 4.3 and 4.4, it was seen that treatment P2 was relatively significantly different from P0 and P1 because P2 contained nutrients which can meet the needs of plants and contribute to the vegetative growth of chili lines on peatlands.

The highest number of leaves of chili plants was found in P2 treatment either on Line 01, Line 03 and Line 08 with an average number of leaves about 54.47 leaves, 58.77 strands and 53.03 strands. According to Lestari et al. (2007), they said that dolomite lime as a calcium supply material is taken from the soil as Ca2+ cations because the availability of Ca2+ and other elements causes better vegetative growth.

The results of the analysis of variance showed that the treatment of fertilizer and lime as well as on the use of lines were not significantly different in the canopy diameter parameter. The value of the diameter of the canopy on the use of the line was in the range of 15.70-56.07 cm. The line with the lowest canopy diameter value was Line 03 with P0 treatment and the highest was Line 03 with P2 treatment. The larger diameter of the plant crown is expected to produce more fruits (Kusmanto et al., 2015).

The results of the observations showed that the application of fertilizer and lime treatment had no significant effect on the leaf area parameters. Leaf area reflects the area of the part that carries out the photosynthesis process. The highest leaf area value in each tested line was found in P1 treatment. Prasetya (2009) said that the fresh weight of the plant is influenced by plant height and leaf area, the higher and larger the leaf area, the higher the fresh weight of the plant is.

The value of the flowering age of several chili plant lines was in the range of 35-49 days after planting (DAT). The relatively fast flowering age was found in Line 01 and Line 03 treatment P2, while the relatively long flowering age was found in Line 03 and Line 08 treatment P1. Flowering age in this study showed that the P2 treatment had a relatively faster average flowering age compared to other treatments for the three lines, but it did not guarantee that the fastest flowering age would also show the fastest harvest age.

Figure 4.6 showed that the fastest harvesting age was found in Line 01 treatment P1 and Line 03 treatment P2, which were 76 days after planting (DAT). According to Lakitan (1996) stated that plant production is highly dependent on plant vegetative growth. Faster harvesting age can extend the harvest period of longer plants, so that the production period is also longer (Dalimunthe et al., 2016).

The use of three chili lines did not significantly affect the number of fruits per plant parameter. The number of fruits per plant Strain 01, Line 03 and Line 08 produced a relatively higher number of fruits compared to P2 treatment. This indicated that when chili plants were planted in peat soil conditions, treatment should be given before carrying out the cultivation process. This proved that the use of organic and inorganic fertilizers affects crop yield potential. In addition, it shows that organic fertilizers are indispensable for vegetable crops to increase crop yields (Nurlenawati et al., 2010).

According to Kusmanto et al. (2015), it was stated that total fruit weight (BBT) was all fruit harvested, both good and bad/rotten. BBT is better known as yield potential. The value of total fruit weight on the use of planted lines was in the range of 6.10-60.02 grams. The line with the lowest total fruit weight value was Line 03 treatment P0 and the highest total fruit weight value was Line 03 treatment P2. According to Abdurahman et al. (2000), the greatest role of materials is in the interaction with the physical properties of the soil, while the role of nutrient supply for plants has received less attention because the amount of nutrients is relatively small and slowly available.

The yield potential of three chili lines of Line 01 had a higher yield potential than Line 03 and Line 08 in all fertilizer and lime treatments. The three lines had potential yields of Line 01 (2.84 tons/ha), Line 03 (2.53 tons/ha) and Line 08 (2.12 tons/ha). However, the yield potential of three chili lines in each was found that Line 03 with P2 treatment had the highest total production among all lines and treatments with a value of 1.67 tons/ha.

CHAPTER 5
CONCLUSION AND SUGGESTIONS

5.1 Conclusion

From the results of this study, it could be concluded that the use of Line 03 (F1012005-141-16-35-1-4) of red chili at the highest estimated production value was 1,667 tons/ha with P2 treatment (3 kg of dolomite lime per plot (10 ton/ha) and chicken manure 3 kg per plot (10 tons/ha)). It was followed by the highest mean on the parameters, namely plant height with an average of 40.63 cm, number of leaves with an average of 58.77 strands, canopy diameter with an average of 56.07 cm, flowering age 35 days after planting and harvesting age 76 days after planting.

5.2 Suggestions

Based on the results of research that has been carried out, the cultivation of red chili plants in peatland can be planted using Line 03 (F1012005-141-16-35-1-4) with P2 treatment (dolomite lime 10 tons/ha and chicken manure 10 tons/ha). Ha). It is expected that further research in the future will be carried out using the same chili line in order to determine the optimal growth and yield in peatlands.

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