THESIS

EVALUASI PERTUMBUHAN DAN PRODUKSI BEBERAPA AKSESI TANAMAN JAGUNG (*Zea mays* L.) UNSRI

THE EVALUATION ON GROWTH AND PRODUCTION OF SEVERAL UNSRI-MAIZE ACCESSIONS (Zea mays L.)

Putri Amelia
05091281621046

AGRONOMY STUDY PROGRAM
AGRICULTURAL CULTIVATION DEPARTMENT
FACULTY OF AGRICULTURE
SRIWIJAYA UNIVERSITY

SUMMARY

PUTRI AMELIA. The Evaluation on Growth and Production of several Unsri-maize accessions (Supervised by **ENTIS SUTISNA HALIMI** and **MERY HASMEDA).**

Research aimed to determine and evaluate growth and production of several Unsri-maize accessions. The research was carried out from November 2019 to February 2020 in collaboration with farmers in farm-land area at Toto Mulyo village, East Lampung Regency, Lampung. This research was designed as a Nested model of Randomized Block Design (RBD). Research evaluated eight accessions namely Unsri-J1, Unsri-J2, Unsri-J3, Unsri-J4, Unsri-J5, Unsri-J6, Unsri-J7, Unri-J8, and a hybrid varieties of Bisi-18 as control. Each accession consisted of five blocks with three sample plants, so there were fifteen sample-plants in each experimental unit. The parameters observed included growth paramaters of plant heigth, dry-weight of the plant, height-position of cob, and percentage of lodging. Production parameters included dry-weight of seeds each cob and accession, dry-weight of 100 seeds, cob weight each plant, cob length, cob diameter and flowering period. In addition, other parameters were also observed and calculate such as harvest index, husk-cover score, leaf angles, leaf color and stem-base colors. The result showed that in general Unsri-J1 accession showed the best characters and highest production among other accessions and equivalent to the control variety. In addition, Unsri-J5 accession showed promising growth potential, but need to be improve the production and homogenity.

Keywords: *Evaluation, growth, maize, production, Unsri-J1-J8.*

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This thesis was written to fulfill one of the requirements to accomplish S1 degree at the Faculty of Agriculture, Sriwijaya University.

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APPROVAL SHEET

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By :

Putri Amelia
05091281621046

Advisor 1

Dr. Entis Sutisna Halimi, M.Sc
NIP. 196209221988031004

Advisor 2

Dr. Ir. Mery Hasmeda, M.Sc.
NIP. 196303091987032001

Certified by,
Dean of the Faculty of Agriculture

Prof. Dr. Ir. Andy Mulyana, M.Sc.
NIP. 196012021986031003

Thesis of The Evaluation on Growth and Production of Several UNSRI-Maize Accessions (Zea mays L.) has been examined and revised based on the suggestions of the examineers.

Examination Committee

1. Dr. Entis Sutisna Halimi, M.Sc. Chairperson ( )
   NIP. 196209221988031004

2. Dr. Ir. Mery Hasmeda, M.Sc. Secretary ( )
   NIP. 196303091987032002

3. Prof. Dr. Ir. Rujito A. Suwignyo, M.Agr. Member ( )
   NIP. 196209091985031006

4. Dr. Ir. Dwi Putro Priadi, M.Sc. Member ( )
   NIP. 195512231985031001

Indralaya, November 2020

The Head of Agricultural Cultivation Department	The Coordinator of Agronomy Study Program
Dr. Ir. Firdaus Sulaiman, M.Sc.	Dr. Ir. Yakup, M.S
NIP 195908201986021001	NIP 196211211987031001

BIOGRAPHY

The writer’s full name is Putri Amelia who was born in Purbolinggo, East Lampung on June 8th, 1997, is the second child of the couple Mr. Wahyu and Mrs. Rosdiana. The writer has 3 brothers, namely Akbar Rohim, Azriel Bayu Saputra, and Bagus Maulana Fahrezi.

The education that the writer has taken is the Elementary School number 1 Taman Negri which was completed in 2009, the Junior High School number 1 Purbolinggo which was completed in 2012 and the Senior High School number 1 Purbolinggo which was completed in 2015. Since August 2016 the writer has been listed as a student at Agronomy Study Program, Department of Agricultural Cultivation, Faculty of Agriculture, Sriwijaya University through the SBMPTN exam (Joint Selection to Enter State Universitiy).

The writer followed the organization during study both internally and externally at Sriwijaya University. Internal organizations include the Agronomy Student Association (Himagron), Faculty Da'wah Institute (LDF) BWPI, Student Representative Council (DPM) KM FP Unsri, BO Kurma (Student Research Community) FP Unsri, and external organizations, namely the Indonesian Muslim Student Action Union (KAMMI). In addition, the writer has also been listed as a lecturer assistant for Botany and Plant Physiology courses.

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On this occasion the writer would like to thank Dr. Ir. Entis Sutisna Halimi, M.Sc. and Dr. Ir. Mery Hasmeda, M.Sc. as a supervisor who had been willing to take the time, provide guidance and motivation so that the writing and implementation of this thesis can be completed properly. The writer would like to thank to Prof. Dr. Ir. Rujito Agus Suwignyo, M.Agr. and Dr. Ir. Dwi Putro Priadi, M.Sc. as the examiner lecturers who had been willing to take the time to test and provide suggestions and input in order to perfect this thesis. Thank you to the Academic Advisor as well as the PL Supervisor, Dr. Ir. Maria Fitriana, M.Sc. who had provided educational guidance and advice to the writer.

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The writer realizes that there were still impefections in the writing of this thesis so that constructive criticism and suggestions are needed. Hopefully this thesis can be useful for readers as a means of developing knowledge. Last, the writer would like to say thank you.

Inderalaya, November 2020

Writer.

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INTRODUCTION

1.1. Background

Maize (Zea mays L.) is one of the important food commodities in Indonesia after rice which is not only used as food for humans but is also used as a staple food in the poultry feed industry. According to data from the Central Statistics Agency (2015), in 2014 with a land area of 3.8 million hectares, maize production in the form of dry shells reached 19.03 million tons or an increase of 2.81% compared to 2013 (18.51 million tons). Meanwhile, in 2015 with a land area of 3.7 million hectares, maize production in the form of dry shells reached 19.61 million tons. The need for maize in Indonesia is still high, causing the amount of maize production to continue to be increased both to meet import and export needs.

Maize productivity can be increased by using high yielding varieties, because maize productivity is strongly influenced by the genetic quality of the varieties planted (Yasin et al., 2010). The use of superior varieties that are tolerant of environmental threats (disease, pests and climate) is an important component that affects the stability of maize yields. The breeding program is directed at producing varieties that are adapted specifically to areas with a certain climate and soil (Mejaya et al., 2010).

Several new accessions of maize in the Department of Agricultural Cultivation have been developed in the context of a research program starting in 1999 which was carried out by assembling UNSRI Accessions using the initial parent of the SA-3 acid-tolerant accession which was the result of development by CYMMIT. SA-3 was crossed with several local varieties such as Antasena and Arjuna to obtain GS-5 and GS-10 populations. Then in 2002, crosses from several populations between accessions of high protein maize (HQPSSS) and local varieties, namely Arjuna and Antasena, resulted in populations of Toray-1 and Toray-2. These new accessions have good agronomic properties and have yield potentials ranging from 4.25 tons to 6.47 tons of dry shells each hectare with a protein content of 9.84% to 11.30% (Halimi et al., 2011). These accessions were then crossed and produced several new corn accessions named Unsri-J1 to Unsri-J8. Information on superior genetic characteristics in accessions from these parents is presented in the following table.

Table 1.1. Information on superior genetic characteristics on accessions of origin (parents).

NO	ACCESSIONS/VARIETIES	DESCRIPTION
1	SA-3	The maize accession SA-3 developed by CIMMYT (Mexico) has been proven to be able to grow and produce well in acidic soils with a pH of about 4.5 and an Al saturation of 35%.
2	HQPSSS	The accession of HQPSSS maize comes from Purdue university with the advantages of high protein content, namely 11.73%, lysine amino acid content of 43.1 grams/kg protein, normal seeds, not brittle and hard.
3	ARJUNA	The Arjuna variety is a free pollinated variety with a potential yield of 4.3 tons/ha, an early age (85-90 days), and resistance to downy mildew.
4	ANTASENA	Antasena variety is a free pollinated variety that is resistant to acid soil but not downy mildew.

Source : Halimi (2019).

Accessions produced in previous related studies need to be tested in both multilocation and climate to evaluate plant growth, development and productivity. For this reason, in this study an evaluation of the growth and production of maize accessions (Zea mays L.) UNSRI which had been produced in previous related studies.

1.1. Objectives

The objective of this study was to determine and evaluate the growth and production of several accessions of maize (Zea mays L.) UNSRI.

1.2. Hypothesis

The hypothesis of the research was

1. It was estimated that growth and production of maize (Zea mays L.) varied in each accession.
2. There were several numbers of plants that have superior characteristics in each accession.

CHAPTER 2
LITERATURE REVIEW

2.1. Overview of Maize (*Zea mays*. L)

Figure 2.1. Maize Plant (Syarif dan Amin, 2016)

Maize (Zea mays L.) is a type of grass plant (strong grass), slightly clumped with rough stems, single seed (monocot) with an age of ± 3 months (Nuridayanti, 2011). According to Iriany and Andi (2007) the classification of maize plants is as follows :

Kingdom : Plantae
Divisio : Spermatophyta
Sub divisio : Angiospermae
Class : Monocotyledoneae
Ordo : Poales
Familia : Poaceae
Genus : Zea
Spesies : *Zea mays* L.

Maize is an annual plant which generally has a plant height of 1 m to 3 m, but there are varieties that reach 6 m in height. The parts of the maize plant consist of: Roots, Stems, Leaves, Flowers, Fruits and Seeds.

Maize plants have fibrous roots and have three types of roots, namely adventitious roots, seminal roots and hook support roots. The seminal root is the development of the radicle and embryo. Adventitious roots develop from nodes at the ends of the mesocotyl (corn stalks) that appear in two or three nodes above the soil surface (Subekti et al., 2008).

Corn stalks are long cylindrical in shape which are insulated at the node and are segmented. The number of segments on corn stalks ranges from 8 to 21 segments (Tjitrosoepomo, 2005). In general, maize plants have stems that are not branched. The function of corn stalks is not only as a place for growing leaves but also as a place for the exchange of nutrients carried by the xylem and phloem vessels. Phloem moves to carry sucrose to plant parts in the form of liquid (Belfield and Brown, 2008).

Leaves and stems on maize plants cannot be clearly distinguished in the early stages of plant growth because the growing point is still below the ground and can only be distinguished after the appearance of the first 5 leaves. Leaves appear on stem segments formed from the midrib and leaves. The leaf midrib appears parallel to the brownish stem and covers almost the entire corn stalk (Belfield and Brown, 2008). The number of leaves of maize varies depending on the variety but in general there are 20 leaves. The diameter of the corn stalk will continue to increase along with plant growth and cause 7 to 8 leaves at the bottom of the maize plant to fall out (Belfield and Brown, 2008).

Flowers on maize plants calssified into imperfect flowers because they have male and female genitalia on different flowers, and are also called incomplete flowers because they do not have petals (flower crown) and sepals (petals). Male flowers on maize plants are located at the top (tip of the stem), while female flowers are located on the 6th or 8th leaf of the male flowers. Pollination occurs by the attachment of pollen to the maize hair which is generally assisted by the wind. The best pollination occurs in the morning. The process of forming maize pollen takes 7 to 15 days.

Maize consists of cobs, seeds and kelobot (wrapping leaves). Maize cobs emerge from the nodes on the internodes in the form of shoots that develop into cobs. On the cob there are maize kernels that are neatly lined up (Paeru and Dewi, 2017). Generally, there are 8 to 20 rows of seeds on a corncob consisting of 200 to 400 seeds. Maize kernels have different colors, shapes and endosperm content depending on the type (AAK, 2006).

Seed in maize is the most important part in the harvesting process which consists of 3 main parts, namely the cell wall, endosperm, and embryo. The content contained in maize kernels on average include 10% protein, 70% carbohydrates, and 2.3% fiber as well as vitamins A and E (Belfield and Brown, 2008).

2.2. Maize Plant Growth

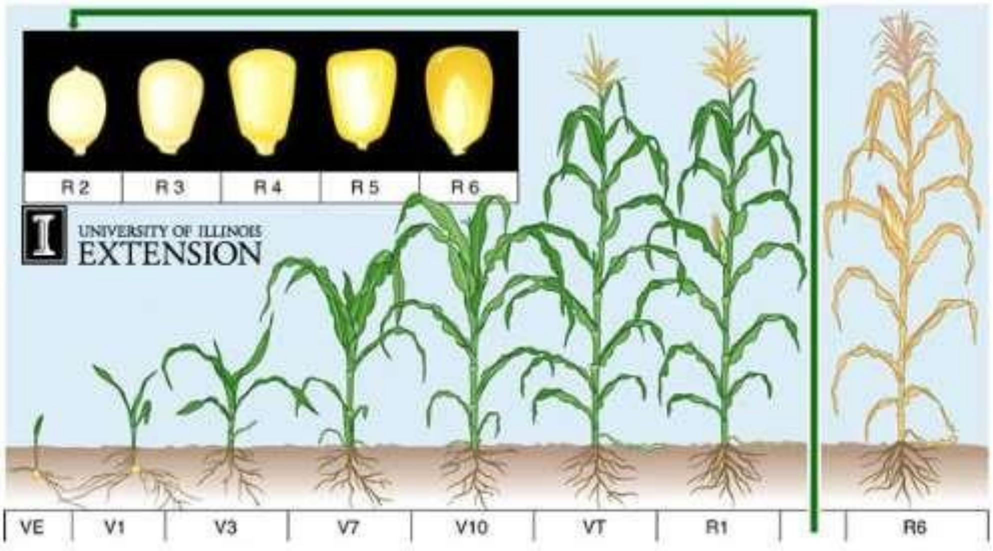


Figure 2.2. Maize Plant Growth Phase

The growth of maize plants can be grouped into three phases, namely: (1) Germination phase, germination begins when the water imbibition process is characterized by swelling of the seeds until the first leaves appear; (2) The vegetative growth phase, which begins with the appearance of the first fully open leaf until tasseling (the release of male flowers) and before the release of female flowers (cyclical); (3) The generative growth phase, namely the phase after flowering to physiological maturity. Germination phase begins to appear 4 to 5 days after planting, in a humid environment the emergence of uniform sprouts. However, in cold or dry environmental conditions, the appearance of sprouts can last up to 2 weeks after planting.

After the germination phase, the growth of maize plants goes through the following phases:

a. Pahse V3-V5 (total number of fully opened leaves 3-5)

Phase V3–V5 takes place when the age of the plant ranges from 10 to 18 days after germination. Seminal roots in this phase have begun to stop growing, root nodules have begun to be active, and there is a growing point on the soil surface which is strongly influenced by temperature. Low temperatures will slow the release of leaves and delay the formation of male flowers.

b. Phase V6-V10 (total number of fully open leaves 6-10)

Phase V6-V10 takes place when the plant is 18 to 35 days after germination. Roots develop and spread in the soil very quickly as well as root elongation which increases rapidly. Male flower buds (tassel) and cob development begin in this phase (Lee, 2007). In this phase, fertilization is very necessary to meet plant nutrient needs because plants begin to absorb nutrients in greater quantities.

c. Phase V11- Vn (total number of fully open leaves 11 to the last leaf 15-18)

The V11-Vn phase has taken place when the plant is 33 to 50 days after germination. The accumulation of dry matter and plant growth in this phase increases and takes place very quickly. In this phase, maize plants need relatively high nutrients and water to support plant growth. Maize plants are very sensitive to drought stress and nutrient deficiencies so that they can affect growth and development, especially cobs and can even reduce the number of seeds in one cob because the cobs shrink and consequently reduce yields (Lee, 2007). The drought of plants in this phase will slow the emergence of female flowers (silking).

d. Tasseling Phase / VT (male flowering)

The tasseling phase is characterized by the presence of the last branch of the male flower 2 to 3 days before the appearance of the female flower (cob hair). In this phase the plant height and biomass produced almost reached a maximum of 50 % of the total dry weight of the plant. Plants begin to spread pollen (pollen). Nutrient absorption produced by plants is respectively N (60% to 70 %), P (50 %), and K (80% to 90%).

e. Phase R1 (silking)

The R1 (Silking) phase occurs 2 to 3 days after tasseling which is characterized by the appearance of corn hairs from inside the cob wrapped in cob. Cob hairs that appear are ready to be pollinated for 2 to 3 days and will continue to grow lengthwise 2.5 cm to 3.8 cm every day until pollinated. Pollination that occurs is when the pollen on the male flower falls right on the surface of the fresh cob hair and takes 24 hours to get to the egg (ovule) so that fertilization occurs which will produce an ovule. The resulting ovule has a clear inside and contains very little liquid. The absorption of N and P nutrients in this phase takes place very quickly and K nutrients are absorbed almost completely (Lee, 2007).

f. Phase R2 (blister)

The R2 phase appears at 10 to 14 days after cycling (the emergence of female flowers). It is characterized by cob hair that is dark in color and has dried. In this phase, the size of the cobs, cobs and corn husks almost reaches perfect shape, the corn kernels begin to appear blistered white, starch accumulation occurs into the endosperm, and the moisture content of the seeds is around 85% which will continue to decline until harvest.

g. Phase R3 (cook milk)

The R3 phase occurs after 18 to 22 days after cycling (flowering female). In this phase, the filling of the seeds, which was initially a clear liquid, turned into milk. Each seed undergoes a very rapid accumulation of starch, the cells in the endosperm are completely formed and the color of the seeds has begun to appear and the water content reaches 80%. Drought that occurs in this phase can reduce the size and number of seeds formed.

h. Phase R4 (dough)

The R4 phase is characterized by the inner seeds that have not yet hardened in the form of a paste, the moisture content of the seeds is around 70% which occurs about 24 to 28 days after cycling (female flowering).

i. Phase R5 (seed hardening)

The R5 phase is characterized by all seeds that are fully formed and occur 35 to 42 days after cycling (female flowering). The accumulation of dry matter in this phase will immediately stop and the moisture content of the seeds will reach 55%.

j. Phase R6 (physiological cooking)

Maize plants enter the physiological ripe phase at 55 to 65 days after cycling and the seeds on the cobs have reached their maximum dry weight which is indicated by the starch layer on the seeds which has hardened and developed completely and has formed a blackish brown abscission layer. The formation of a black layer starts from the seeds at the base to the tip of the cob which occurs gradually. In the kelobot hybrid variety and the upper leaves are still green or have a stay green characteristic even though they have entered the physiological phase. Seed moisture content ranges from 30 to 35% with a total dry weight and absorption of NPK nutrients by plants reaching 100%.

2.3. Growing Conditions

Maize plants need water with rainfall of about 100-140 mm/month and planting maize can be started when the rainfall has reached 100 mm/month. Fertile soil is needed so that maize plants can produce well. This is because maize plants require good aeration and large amounts of nutrients, especially nitrogen (N), phosphorus (P), and potassium (K). Fertilization of N, P and K can accelerate the age of female flowering and increase the percentage of plant height. Therefore, maize plants require the addition of N, P, K fertilizers and organic fertilizers such as compost and manure (Central Center for Agricultural Research and Development, 2008).

Maize can grow well on various types of soil, the most suitable soil for maize is dusty loam soil with soil acidity (pH) 5.5 – 7.0 and soil slope < 8% to prevent erosion during the rainy season. Maize plants are generally grown in the lowlands but can also be planted in mountainous areas at an altitude of 1000 m – 1800 m above sea level (dpl) (Fitriani, 2009).

Fitriani (2009) stated that the optimum temperature for the growth of corn plants ranges from 23-27o C. In addition, important factors that affected the growth of maize plants include sunlight, humidity and wind. The location for planting corn plants must get sufficient sunlight and should not be shaded so that the production results obtained are not reduced.

2.4. Free-pollinated Maize Plants

Products of improving genetic resources in maize are generally grouped into two, namely free-pollinated or composite varieties and hybrid varieties. Free-pollinated varieties are assembled by recombining a number of selected phenotypes that are relatively uniform and represent populations whose genetic performance is improved. The recombined phenotypes had the same maturity age, plant height, ear height and other important characters. Furthermore, the recombination produces new genotypes that are relatively uniform and have little variation on certain characters. The maize plant breeding program emphasized free-pollinated varieties in the 1980s. This is because free pollinated varieties have advantages, among others; Assembling new varieties is easier and cheaper, source seed production and seed distribution are easier, farmers do not need to buy seeds at the beginning of each year (Subandi, 1988).

Free-pollinated varieties have an important role in increasing national maize, especially in the early stages and before the development of hybrid maize varieties (commercial seeds). In 1980 the Center for Research and Development of Maize released the Arjuna variety which has a higher yield potential (4.3 tons/ha), has an early maturity (85-90 days), and is resistant to downy mildew. Metro, Harapan, New Hope and Arjuna varieties were popular free-pollinated varieties during this period. Arjuna variety has wide adaptability because it has high yield stability and low response to environmental changes (Dahlan and Mejaya 2007).

During the 1990s, a number of maize varieties were released with a potential yield of 5 tons/ha, including the varieties of antasena, bayu (white seeds), wisanggeni, laligo, bisma (yielding 5.7 tons/ha) and solar (seeds released by the private company). One of the varieties that have been released and developed is the antasena variety, which is a maize plant variety that is tolerant to acid soils but is not very developed because it is not resistant to downy mildew.

Free-pollinated varieties can spread widely through distribution among farmers (between communities) and dry shelled seeds from the harvest can be selected to be reused as seeds for the next growing season (farm-saved seed) but the supply of high quality seeds is not always sufficient in every season.

2.5. UNSRI Maize Plant Breeding

One of the ways to develop maize in Indonesia was through the introduction of maize accessions SA-3 and HQPSSS to Indonesia in 1996 on the basis of a regulation from the Minister of Agriculture of the Republic of Indonesia Number: UP.2.20.226. Maize accession SA-3 is a maize accession developed by CIMMYT (Mexico) and has been tested to be able to grow and produce well on acid soils which have a pH of about 4.5 with an Al saturation level of 35%. The maize accession HQPSSS is a maize accession developed by Purdue University (USA) and has the advantage that the protein quality level is quite high, around 11.73% protein and the amino acid Lysine level is 43.1 grams/kg protein and the seeds are normal, not brittle due to high levels of protein. the protein contains the opaque-2 gene that has been genetically modified. This is beneficial and very important in the seed storage process so that the seeds can be resistant to warehouse pests and can also prevent seed damage during processing and transportation (Halimi, et al., 2011).

The research and breeding program for maize is carried out to develop free pollinated varieties that are tolerant of acid soils and high protein content. Sources of variance were obtained from the introduced germplasm of SA3 and HQPSSS as well as the national varieties Arjuna and Antasena. The “Top cross” cross between the introduced HQPSSS as the male parent and the national varieties Arjuna and Antasena as the female parent resulted in parent populations named Toray-1 and Toray-2. The parent population resulting from a single cross Toray-1 and Toray-2 was then named Unsri-J7 and Unsri-J8. “Top cross” crosses between introduced accessions SA-3 as male parents and national varieties Antasena and Arjuna as female parents resulted in populations named GS-5 and GS-10, respectively. The population resulting from a single cross from the GS-5 and GS-10 populations was then named Unsri-J5 and Unsri-J6 (Halimi, et al., 2011). The research was continued by crossing selected plants from the Toray-1 and Toray-2 populations crossed with the GS-5 and GS-10 populations so as to produce 4 new accessions of maize plants named Unsri-J1, Unsri-J2, Unsri-J3, Unsri -J4 (Purba, 2007).

CHAPTER 3
RESEARCH METHODLOGY

3.1. Location and Time

The research collaborated with farmers on agricultural land in Toto Mulyo Village, Way Bungur District, East Lampung Regency, Lampung. Research duration started in November 2019 until February 2020.

3.2. Tools and Technique

The tools used in this research were: 1) Land Management Tools, 2) Stationery, 3) Protractor, 4) Caliper, 5) Camera, 6) Ruler or Meter, 7) Scales, 8) Sprayer Tank.

The materials used in this study were 1) Maize Seeds Unsri-J1, Unsri-J2, Unsri-J3, Unsri-J4, Unsri-J5, Unsri-J6, Unsri-J7 and Unsri-J8, 2) Hybrid Maize Seeds (BISI 18), 3) Herbicides (1 L/ha), 4) Insecticides (240 ml/ha), 5) Buffalo Manure (2 Tons/ha), 6) KCL Fertilizer (100kg/ha), 7) NPK Fertilizer (200 kg/ha), 8) SP36 (100 kg/ha), 9) Urea (400 kg/ha).

3.3. Genetic Material

The genetic material used in this study consisted of 8 accessions of Unsri-J1, Unsri-J2, Unsri-J3, Unsri-J4, Unsri-J5, Unsri-J6, Unsri-J8 and 1 hybrid maize variety (BISI 18) as satandart for maize used by farmers.

Table 3.1. The genetic origins of the maize accession crosses used in research.

NO	ACCSESION	DESCRIPTION
1	UNSRI-J1	Cross population GS5 x Toray-1
2	UNSRI-J2	Cross population GS5 x Toray-2
3	UNSRI-J3	Cross population GS10 x Toray-1
4	UNSRI-J4	Cross population GS10 x Toray-2
5	UNSRI-J5	Population GS-5
6	UNSRI-J6	Population GS-10
7	UNSRI-J7	Population Toray-1
8	UNSRI-J8	Population Toray-2
9	BISI-18	Hybrid maize varieties commonly used by farmers in East Lampung district.

Unsri-J1 to Unsri-J8 accession maize plants were the result of top cross and selfing crosses from Toray-1, Toray-2 and GS-5.GS-10. Accessions Toray-1 and Toray-2 came from open crosses of HQPSSS accession populations with national varieties, namely Arjuna and Antasena varieties. Accessions GS-5 and GS-10 were derived from crosses accession SA-3 with national varieties Antasena and Arjuna (Dewa, 2017).

3.4. Research Method

The research method used was a randomized block design (RAK) with nested groups. There were 8 accessions as treatment factors, namely Unsri-J1, Unsri-J2, Unsri-J3, Unsri-J4, Unsri-J5, Unsri-J6, Unsri-J7, Unsri-J8 and 1 variety as standard, namely the Bisi-18 Hybrid variety with 5 groups in each accession and each group had 3 plant replications, so that in each treatment there were 15 sample plants.

Table 3.2. Sequence of replication groups in each accession

Group	No. Sample Plant
1	Sample Plant 1 – 3
2	Sample Plant 4 – 6
3	Sample Plant 7 – 9
4	Sample Plant 10 – 12
5	Sample Plant 13 – 15

The statistical model of the experiment was as follows:

$$\boldsymbol{Y_{ij} = \mu + \tau_i + \beta_{j(i)} + \varepsilon_{ij}}$$

Description :

Y_{ij} = Observation value in the treatment of the i- group j

μ = General Middle Value

τ_i = Influence caused by the i- Accession

$\beta_{j(i)}$ = Group influence nested in each accession as an error

ε_{ij} = Sampling error

Data analysis was performed using analysis of variance (ANOVA) followed by the 5% LSD test.

3.5. Procedures

3.5.1. Land Preparation

The land used was land with an area of 905 m2 which was located in Toto Mulyo village, East Lampung district, Lampung. The land used was plowed first to loosen the soil. The land with an area of 905 m2 was a land consisting of 2 plots. The first plot was for accessions from UNSRI-J1 to UNSRI-J8 with a total area of 480 m2, while the second plot was for maize hybrid varieties (BISI 18) with an area of 425 m2. The first plot of land was divided into 8 parts each occupied by a different accession.

3.5.2. Preparation of Planting Materials

Before planting, the seeds to be planted were given an insecticide (active ingredient imidacloprid 350 g/l) which was a seed treatment insecticide so that the plant seeds were protected from insects such as ants.

3.5.3. Planting

Planting was carried out using a spacing of 75 cm x 25 cm. Before palnting the land in Tugal as deep as 2-3 cm first to make a planting hole.

3.5.4. Maintenance

Maintenance included watering, weeding, eradicating pests and diseases, and fertilizing. Watering was carried out according to the condition of the land or soil. The weeding process was to clean the nuisance plants around the maize plants. Weed control was carried out by giving herbicides (active ingredient atrazine 500 g/l + mesotrion 55 g/l + surfactant leveling agent) with a dose of 1L/ha. Eradication of pests and diseases was carried out when maize plants were attacked by pests and diseases. The eradication of caterpillars was carried out using an insecticide (active ingredient emmamectin benzoate 30g/l) with a dose of 20 ml (per 15liter tank) then 240 ml of insecticide/hectare was used. Fertilization on maize plants was carried out 4 times during fertilization, namely organic fertilization (1 time) and chemical fertilization (3 times). The first fertilization was organic fertilization using manure from buffalo dung at a dose of 2 tons/ha which was applied at the same time as planting. The second fertilization was chemical fertilization using Urea Fertilizer given about 10 days after planting at a dose of 200 kg/ha. The third fertilization was 1 month after planting with Urea fertilizer (200 kg/ha), NPK fertilizer (200 kg/ha), SP36 (100 kg/ha). The fourth fertilization was carried out when the plants entered the flowering age, namely by giving KCL fertilizer (100kg/ha). Fertilizer was applied between rows on maize plants.

3.5.5. Harvest

Harvesting was done when the maize plants were ripe, the maize cobs were fully loaded or optimally and had reached their maximum age. It was characterized by dry and brown cobs and cobs, yellowed or partially yellow leaves, there was a black layer on the seeds of the institutional part (black layer), dry seeds, hard and firm, when pressed they did not leave an imprint. (Akil dan Dahlan, 2007).

3.6. Observation Parameters

3.6.1. Growth Parameters

3.6.1.1. Plant height (cm)

Height measurement was done once before the plant reached the flowering phase (generative). Plant height was measured from the base of the stem near the soil surface to the tip of the highest leaf.

3.6.1.2. Dry Stover Weight (gram)

The dry weight of the stover was calculated by weighing the plant stove in the form of roots, leaves, stems, dry plants after harvesting.

3.6.1.3. Cob Position Height (cm)

The height of the cob was measured when the maize released the cob, the height was measured from the tip of the base of the maize plant to the base of the cob. Measured together with plant height.

3.6.1.4. Laying Down Percentage (%)

The percentage of fall was obtained from the ratio between the total plants that fell and the plants that were alive at times 100%.

3.6.2. Production Parameters

3.6.2.1. Weight of Dry Shelled Seeds Each Cob (gram)

Weight of dry seeds was taken by weighing maize kernels that had been shelled from each cob and dried. Weighing was done using an analytical balance.

3.6.2.2. Dried Seed Production Each Accession Plot (kg)

Production of dry seeds was calculated by weighing the weight of dried maize kernels in each accession plot.

3.6.2.3. Weight 100 Seeds (gram)

The weight of 100 seeds was calculated by weighing 100 kernels of maize for each accession or treatment.

3.6.2.4. Cob Weight Each Plant (gram)

The weight of the planting cobs was measured by weighing the cobs each plant. Cobs that are weighed without hulls and have been dried in the sun harvested from sample plants.

3.6.2.5. Cob Length (cm)

Measurement of cob length was measured from the base of the cob to the tip of the cob without maize husks, data collection was carried out at the end of the study or after harvest.

3.6.2.6. Cob Diameter (cm)

Measurement of the diameter of the cob was calculated on the largest part of the cob from the tip of the seed to the end of the adjacent seed. Measurements were taken after harvest and dried without hulls.

3.6.2.7. Male Flowering Age (Days)

Flowering age could be determined by looking at the visual appearance (vision) of each plant accession, namely if 50% of the total plants in each treatment plot had produced male flowers which were indicated by the appearance of panicles at the ends of the maize stalks.

3.6.3. Parameters of Other Visible Characteristics

3.6.3.1. Harvest Index (HI)

Harvest index was calculated to determine the ability of plants to distribute assimilate. According to Yadav et al (1994) IP could be calculated using the formula:

$$HI = \frac{Sy}{Sy + (Py)} x100\%$$

Description :

HI = Harvest Indeks (Indeks Panen)

Sy = Yield of dry seeds each plot

Py = Stover weight each plot

3.6.3.2. Husk Cover

Parameters for Closure of husk data were taken by observing the maize cobs which were approaching harvest age and then seen the husks that had covered the maize cobs. Closure of husk were scored according to the perfection of the closures of husk. Score 1: husk closed tightly, so that several cobs can be tied together at the end of the cob. Score 2: husk closed tightly only to the tip of the cob. Score 3: husk closed a bit loosely at the tip of the cob. Score 4: husk covered the cob not well, the tip of the cob was visible. Score 5: husk covering the cob was very bad, some seeds were not protected by the husk cover.

3.6.3.3. Leaf Angle (degree)

Leaf angle was measured simultaneously when measuring plant height using a protractor.

3.6.3.4. Leaf Color and Stem Base Color

The color of the leaves and the color of the base of the stem were observed by visual observation, then photographed.

CHAPTER 4
RESULTS AND DISCUSSION

Research had been carried out by observing a number of variables, both growth, production, and other characteristics. These variables were then analyzed by analysis of variance (annova) and continued with the Least Significant Difference (LSD) test with = 5%. The results of the analysis of these variables were presented in the following table.

Table 4.1. Recapitulation of the F test value, the calculated F- count value of the results of the analysis of variance on variables observed in the study.

No.	Observed changes	F-count	KK (%)
1.	Plant height	3,03*	10,82
2.	Cob height position	5,93*	15,47
3.	Dry stover weight	3,06*	31,08
4.	Dry Shell Weight each cob	$2{,}22^{tn}$	24,85
5.	Cob Weight each Plant	$2{,}14^{tn}$	24,34
6.	Cob Length	$1{,}69^{tn}$	14,93
7.	Cob Diameter	$1{,}18^{tn}$	7,30
8.	Cornhusk Closing Score	$0{,}94^{tn}$	42,17
	F- Table	2,24	

Description : * : Significantly different at the level of α = 5%.
tn : not significantly different
KK : Coefficient of Variance

In the table of the results of the analysis of variance and the LSD test = 5% (Table 4.) it can be seen that growth variables such as plant height, cob height and dry stover weight showed significantly different results, meaning that in these variables there were quite diverse differences between the accessions tested. While the production and other variables such as dry shell weight each cob, cob weight each plant, cob length, cob diameter, and cornhusk closing score had results that were not significantly different, this showed that in these variables there was a fairly uniform equality of values between tested accessions. The Coefficient of Variance from the results of the study ranged from 7.30% to 42.17%.

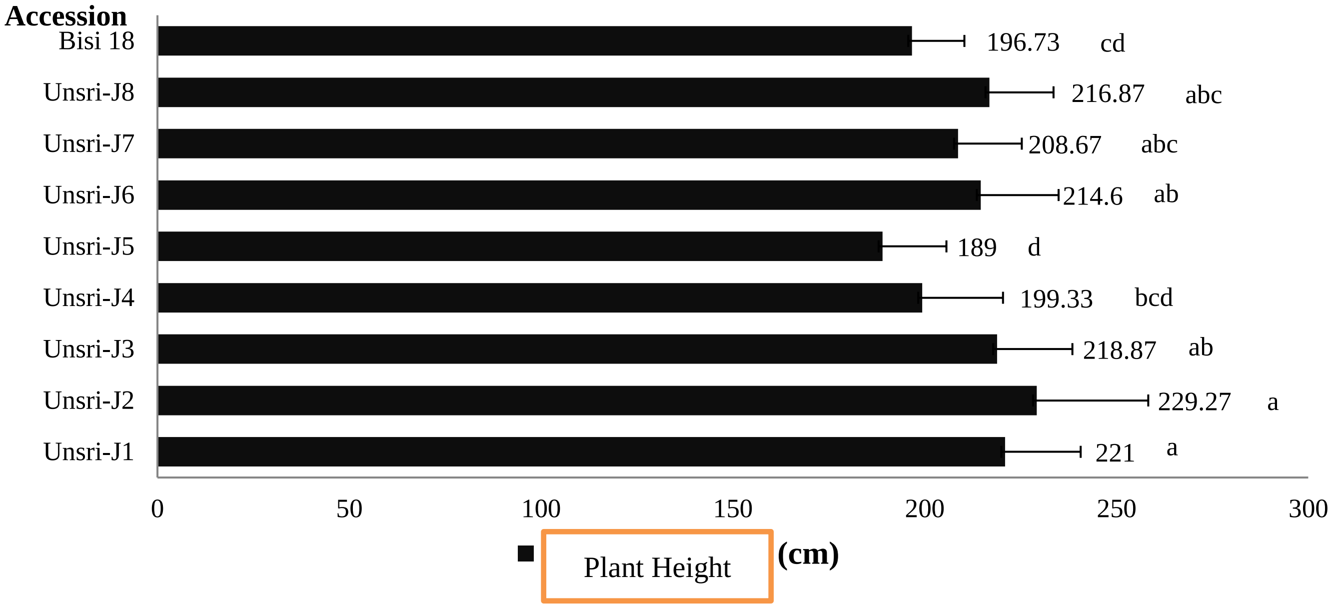
The following was a description of the results of observations and statistical analysis on each observed variable.

4.1. Growth

4.1.1. Plant height (cm)

Plant Height Growth in each accession of Unsri-J1 to Unsri-J8 and Bisi-18 Hybrid Varieties generally showed distinctive morphological characteristics. Analysis of variance and LSD test on the variable plant height showed significantly different results (F-Count = 3.03) and the LSD value at the level of = 5% was 21.665. Based on (Figure 4.1.) it can be seen that Accession Unsri-J2 has the highest average plant height of 229.27 cm. The Unsri-J2 accession had an average plant height that was not significantly different from the Unsri J1 accession, which was 221cm. The lowest average plant height of all maize accessions was found in the Unsri-J5 accession, which was 189.00 cm. The standard deviation value (Figure 4.1.) showed the value of variance contained in each accession. The Unsri-2 accession had the highest standard deviation value for the plant height parameters, which was 23.03069. This showed that the plant height in the Unsri-J2 accession can be said tend to be not in the same height. While the Bisi-18 variety had the lowest standard deviation value of 13.63539, meaning that the Bisi-18 variety had a more same plant height than the Unsri maize accession.

Characters of plant heights of the tested accessions were overall equal and even tended to be higher than the BISI-18 Hybrid Varieties which had a plant height of 196.73 cm. This can be influenced by the inherent nature of each accession. Himawan and Supriyanto (2003) states that differences in plant height could be caused by genetic factors found in plant varieties. Good plant height growth can affect the intensity of sunlight received by maize plants. Wahyudin (2016) states that the easier it is for plants to get access to sunlight, the sunlight needed by maize plants can be fulfilled so that the photosynthesis process can run well and the resulting assimilate can support the growth and production of maize plants, but if the plant height is too high it can trigger maize crop.



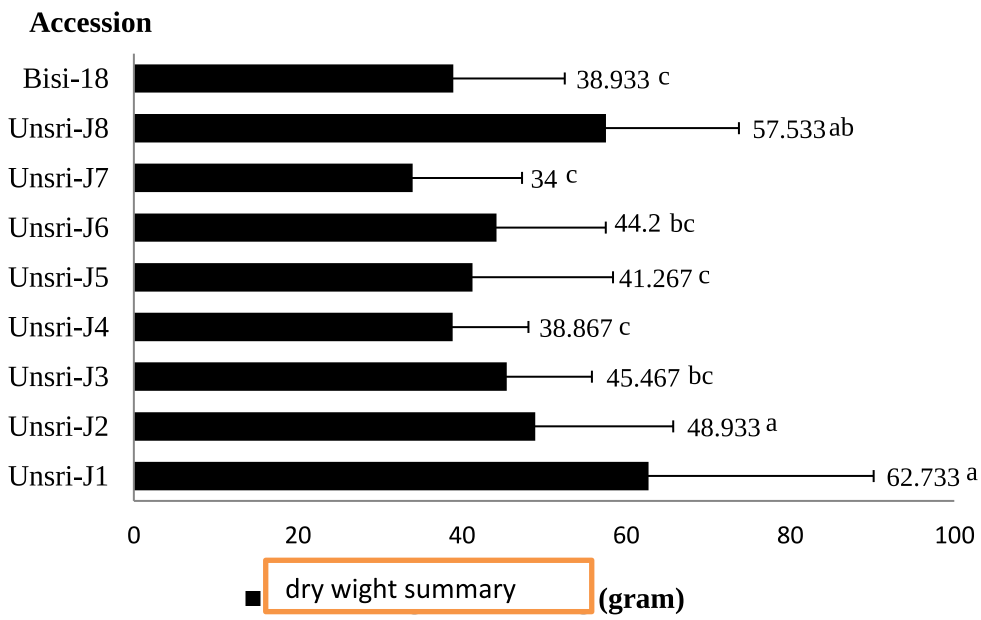
* Numbers followed by the same letter are not significantly different on the LSD Test of 0.05 with a LSD value of = 21,66.

Figure 4.1. Average Maize Plant Height

4.1.2. Dry Stover Weight (gram)

Plant growth can be measured from the increase in biomass produced by plants. One of the methods used to measure plant biomass was by weighing the dry weight of the plant. According to Sitompul and Guritno (1995) in Kusumaningrum (2007), dry weight is preferred for estimating plant growth because it reflects the accumulation of organic compounds synthesized by plants from inorganic compounds. In this study, the weight of maize plant stover was weighed that had been dried in the sun. The analysis of variance and the LSD test on the dry stover weight variable showed significantly different results (F-Calculate = 3.06) with the LSD value at the level of = 5% of 15.323. Based on (Fig. 4.2) it can be seen that the Accession Unsri-J1 had the highest average weight of the stover, which was 62.733 grams. The average lowest dry plant weight of all maize accessions was found in Unsri-J7 accessions, which was 34 grams.

Plant growth was indicated by the increase in size and dry weight of the stover. Overall, it can be seen that the weight of dry stover in accessions Unsri-J1 to accessions Unsri-J8 had almost the same value and even some accessions were heavier than the Bisi-18 Hybrid Variety. This, when associated with plant height, showed that the maize accessions tested were not only tall but also had a fairly good biomass, which could be seen by the size of the stems and leaves which were quite large. However, in terms of the standard deviation of the dry root weight of the plant, Accession Unsri-J1 had the highest value, namely 27.43946. This showed that Accession Unsri-J1 has dry weight which tended to be less uniform than other accessions. Meanwhile, the accession of maize which had the lowest standard deviation value was at Unsri-J4 of 9.226257, meaning that the accession of dry-planted plants in the accession of Unsri-J4 tended to be more uniform than other accessions both in weight and size.



* Numbers followed by the same letter are not significantly different on the LSD Test of 0.05 with a LSD value of = 21,665

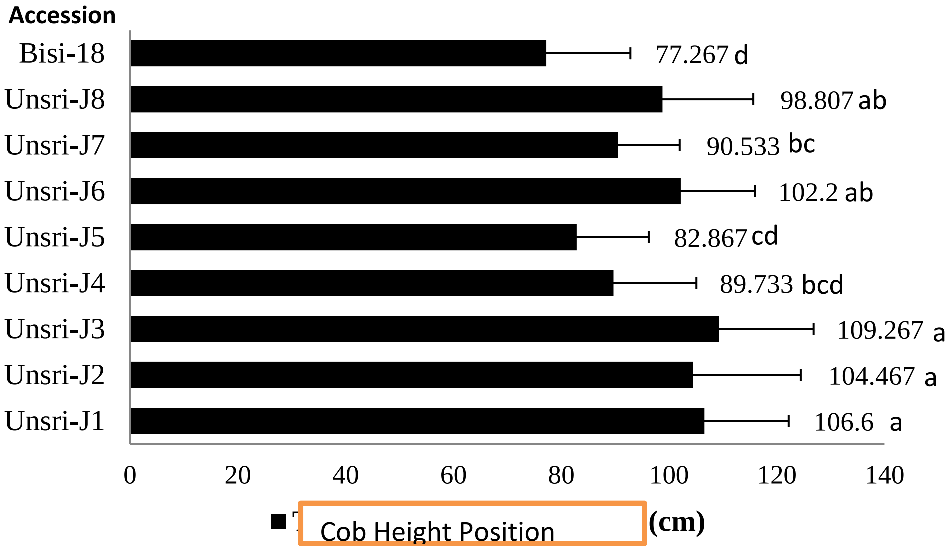
Figure 4.2. Average weight of the plant stover

4.1.3. Cob Height Position (cm)

The position of the cob was related to the height of the plant and the percentage of laying down. According to Zystro (2012), plants that have a plant height that is too high have a great chance of laying down. Although accessions of maize plants Unsri-J1 to Unsri-J8 had a fairly high plant height, the average cob height was <50% to plant height, meaning that the resistance to laying down was still quite good. In addition, the height of the position of the cobs is also closely related to the appearance of uniformity and to consider the ease of harvesting (Hipi *et al.*, 2005).

Based on the results of the analysis of variance and the LSD test, the cob height on some of the maize accessions tested showed significantly different results (F-count = 5.93) with the LSD value at the level of = 5% of 13.21. In (Figure 4.3.) it can be seen that Accession Unsri-J3 had the highest average cob position height of 109.267cm or 49.92% of plant height. While the Bisi 18 Hybrid variety had the lowest average cob height of 77.267cm or 39.27% of plant height. Accessions Unsri-J1, Unsri-J2 and Unsri-J3 had an average cob height that was not significantly different, namely 106.6cm or 48.2% of plant height, 104.467cm or 45.55% of plant height, and 109.267cm or 49.92% of plant Height. The second lowest cob height after the Bisi-18 variety was found in the Unsri-J5 accession, which was 82.867cm or 43.84% of plant height. As for the standard deviation value, the accession that had the best uniformity value was the Unsri-J7 accession with the lowest standard deviation value of 11.4634. Meanwhile, Accession Unsri-J2 had the highest standard deviation value of 19.99238, meaning that the height of the cob position of accession Unsri-J2 tended to be less uniform than other accessions.

Vivianthi (2012) states that the location of the cob is also directly related or related to the pollination process, for cobs (female flowers) which are located closer to male flowers have a greater chance of being pollinated compared to cobs that are far apart.



* Numbers followed by the same letter were not significantly different
on the LSD Test of 0.05 with a LSD value of = 13,21

Figure 4.3. Average Cob Height Position

4.1.4. Laying Down Percentage (%)

The rate of laying down maize plants was influenced by plant height and cob height, where tall plants tended to fall more easily than short plants. According to Zystro (2012) if the maize plant is too high it can cause a fall due to wind or the roots are unable to support the plant, whereas if the maize plant is too low it will be difficult to compete with weeds.

In (Table 4.2.) the results of the recapitulation of the Percentage of Laying Down in each accession, the plant accessions with the highest percentage of laying down were found in the Unsri-J1 accession, which was 5.3% of the total living plants. Meanwhile, the lowest percentage of laying down was found in accessions of Unsri-J4 and Unsri-J7, i.e. 0% of the total living plants, meaning that they did not fall down. Based on this description, it can be seen that the Percentage of laying down on the tested accessions was still considered good for plants because the percentage of laying down ranges from 0% to 5.3%, this was not only influenced by the height of the cob position which was <50% of the plant height but also because the maize accessions tested had strong roots that were able to support the plant. To prevent overcrowding, as long as it did not reduce production of Unsri-J1 can use nitrogen fertilizers with doses that were not too high.

Table. 4.2. Recapitulation of the Percentage of Laying Down in each Accession

Accession	Total of Laying Down	Total of living plant	Laying Down Percentage(%)
J1	16	302	5,3%
J2	7	298	2,34%
J3	6	299	2%
J4	0	292	0%
J5	2	274	0,72%
J6	0	304	4,9%
J7	15	282	0%
J8	1	271	1,47%
B18	7	1515	1,06%

4.2. Production

4.2.1. Dry Shell Weight each Cob (gram)

Seed production was the main goal in maize cultivation. Based on the analysis of variance on the weight of dry shelled each cob on several accessions of maize tested, the results were not significantly different (F-count = 2.22). In (Figure 4.4.) it can be seen that the accession of Unsri-J1 maize had the highest average dry shell weight each cob, which was 126.87 grams each cob. Then followed by Unsri-J2 which had an average dry shelled weight each cob which was not much different from Unsri-J1 which was 126.47 grams each cob. Although the results of the variance analysis showed that the results were not significantly different between the accessions, these two accessions, namely Unsri-J1 and Unsri-J2, had an average value that tended to be higher than the Bisi 18 Hybrid Variety, which was 120.27 grams each cob. Based on the standard deviation value, in general the Bisi-18 Hybrid variety had a dry shelled weight each cob which tended to be less uniform with the highest standard deviation value of 34.91514. Meanwhile, the accession with the lowest standard deviation value was the Unsri-J8 accession with a value of 21.7501 meaning that the dry shelled weight each cob tended to be more uniform than other accessions.

Purba (2015) states that the increase in maize production was strongly influenced by the weight of dry shells each cob. This showed that there was good potential for maize accessions, especially Unsri-J1 and Unsri-J2, to continue to be developed. Accessions Unsri-J1 and Unsri-J2 had hard, dense and abundant seeds so this was thought to affect the dry shell weight each cob. Accessions Unsri-J1 and Unsri-J2 were accessions resulting from crosses between GS-5 and Toray-1 and GS-10 and Toray-2. Each of these accessions was the result of a cross between the SA-3 accession, the HQPSSS accession, the arjuna variety and the antasena variety. Arjuna and Antasena varieties were national maize varieties. Meanwhile, the SA-3 accession was maize accession which was able to grow and produce well in acid soil with a pH of about 4.5 and an Al saturation level of 35%, and the HQPSS accession, which was an accession that had a high protein content and modified opaque 2 genetic material so that it has normal, hard, and tight seeds (Halimi, 2000). Based on this description, it can be said that the corn accessions Unsri-J1 and Unsri-J2 have the desired potential properties derived from crossing their parents so that they are good for development.

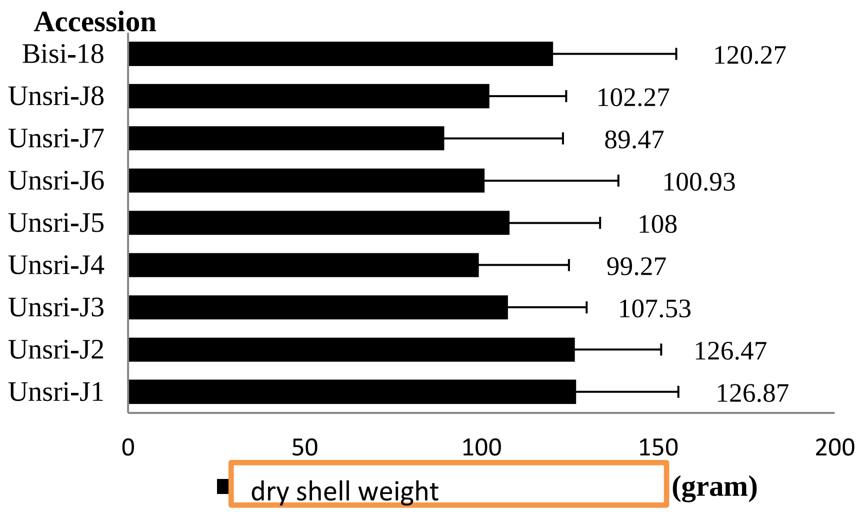


Figure 4.4. Average dry shell weight each cob of each plant

4.2.2. Dried Seed Production each Plot Accession

The yield of seeds was a product called the yield component. Yield components were influenced by management, genotype and environment. It was important to know the dry seed production each accession plot in order to estimate the potential yield each hectare. Based on the data obtained from the research results, it was known that the dry weight each plot of accession which had the highest average value was found in the Bisi-18 Hybrid variety, which was

204.804 Kg each plot area of 425 m2 or can be converted to a hectare area of 4.8 tons each hectare and not much different from the Unsri-J1 maize accession which had the second highest weight value or dry seed production each accession plot after the Bisi 18 Hybrid variety, which was 25.735 Kg each accession plot with a plot area of 60 m2 or can be converted to hectare area of 4.3 tons each hectare. However, based on the genetic potential, the Unsri-J1 accession and the Unsri-J2 accession had a higher value when compared to the Bisi-18 Hybrid which had a yield potential value of 6.76 tons/ha and 6.74 tons/ha compared to 6.44 tons/ha. . This showed that the accessions of Unsri-J1 and Unsri-J2 maize still can be said to be equivalent when compared to the Bisi-18 hybrid variety and had good potential to continue to increase their yields.

Table 4.3. Recapitulation of dry shelled production value each accession plot and genetic potential.

No	Accession	Weight (Kg/plot accession)	Plot area (m^2)	Real production (Ton/ha)	Genetic potential (Ton/ha)*
1.	J1	25,735	60	4,3	6,76
2.	J2	22,897	60	3,8	6,74
3.	J3	20,491	60	3,4	5,73
4.	J4	23,489	60	3,9	5,29
5.	J5	21,620	60	3,6	5,76
6.	J6	20,514	60	3,2	5,38
7.	J7	19, 342	60	3,4	4,77
8.	J8	23,534	60	3,9	5,45
9.	B18	204,804	425	4,8	6,43

* The genetic potential was obtained from the calculation of the weight of dry shelled seeds each cob multiplied by the total population each hectare.

4.2.3. Weight 100 Seeds (gram)

The average weight of 100 seeds each accession in the sample plants tested showed that the Unsri J1 accession had the largest weight value of 100 seeds, which was 40 grams. While the weight value of the lightest 100 seeds was found in the Bisi 18 Hybrid variety, which was 28 grams. Based on this description, it can be assumed that the Unsri-J1 to Unsri-J8 accessions generally had larger seed sizes compared to the Bisi 18 hybrid variety. This showed good potential for the tested accessions. According to Purba (2015) the size of seeds and the number of seeds each cob can affect the increase in production of maize plants.

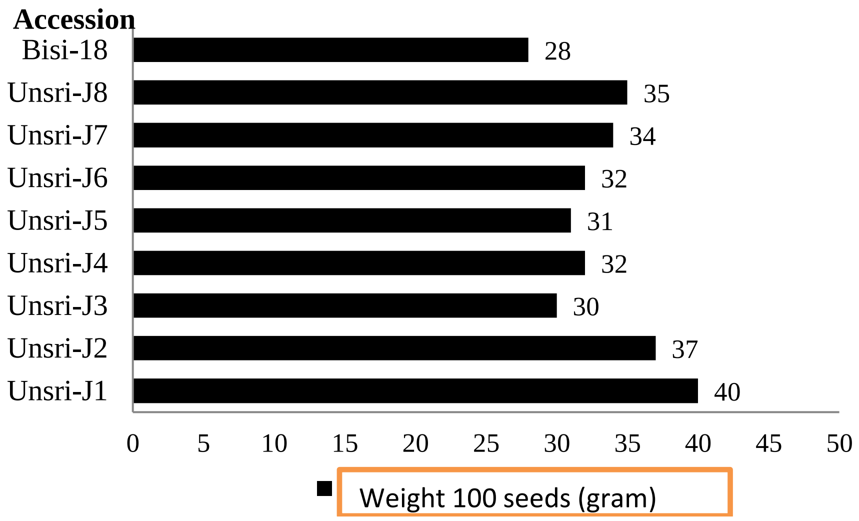


Figure 4.5. Average weight of 100 seeds

4.2.4. Cob Weight Each Plant (gram)

The weight of the maize cob is not only influenced by the diameter of the cob and the length of the cob, it is also strongly influenced by genetic factors such as leaf shape, number of leaves and leaf length or width which will affect the process of plant photosynthesis. Photosynthesis will increase if the absorption of solar energy takes place optimally, so that the production of seeds in maize will also increase and its weight will increase (Wardani, et al., 2009). Maize yields were determined by the fresh weight of the cobs each plant. The higher the weight of the cobs each plant, the higher the yield.

Based on the analysis of variance on the weight of the cobs on several accessions of maize tested, the results were not significantly different (F-count = 2.14). In (Figure 4.6.) it can be seen that the accession of Unsri-J2 maize had the highest average cob weight value of 167 grams each cob. Accession Unsri-J2 had a value that was not much different from accession Unsri-J1 which had an average weight of 165.33 grams each cob. Meanwhile, the lowest average cob weight was found in the Unsri-J6 maize accession which had an average value of 128.73

grams. In the value of the standard deviation of the Unsri-J6 accessions, the variance tended to be high, which was 48.13147. Meanwhile, the accession with the best uniformity of cob weight was the Unsri-J2 accession with the lowest standard deviation of 31.03224.

Based on the description, it showed that there were genetic differences in each accession or variety so that the characteristics that appear such as the weight of the cob and the level of uniformity were different even though they were planted in the same area. Accessions Unsri-J1 and Unsri-J2 had an average value of cob weight that was higher or tended to be equivalent and a level of uniformity that tended to be better when compared to the Bisi 18 Hybrid Variety which had an average cob weight of 151.2 grams.

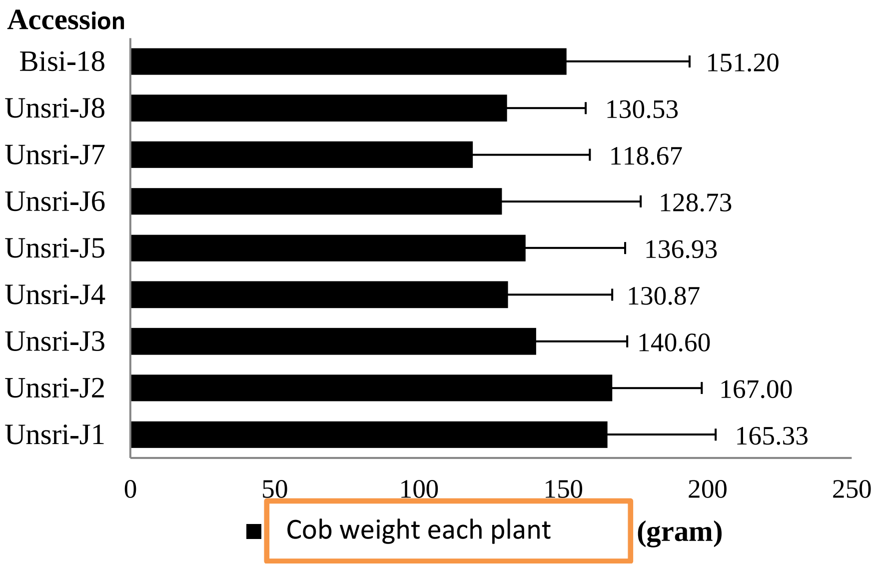


Figure 4.6. Average weight of cobs each plant

4.2.5. Cob Length (cm)

One of the potential yields in maize plants can be seen from the length of the cob as a place for growing seeds (Habibullah, 2018). The results of the analysis of variance on the length of the cob on several accessions of maize that were tested showed that the results were not significantly different (F-count = 1.69). Based on observations (Figure 4.7.) it can be seen that the maize accessions Unsri-J5, Unsri-J1 and Unsri-J2 had good average lengths of cobs, namely 16.6667cm, 16.4667cm, and 16.5cm not significantly different but more height when compared to the Bisi 18 Hybrid Variety, which is 15.9333cm. Meanwhile, the lowest average cob length was found in the Unsri-J7 accession, which was 13.8333cm. Based on the standard deviation value, Unsri-J6 had a variance that tended to be higher than other accessions, which was 3.116775. Meanwhile, Accession Unsri-J8 had the lowest standard deviation value, which was 2.13809. Thus, this showed that there was potential for Unsri maize accessions to increase yields.

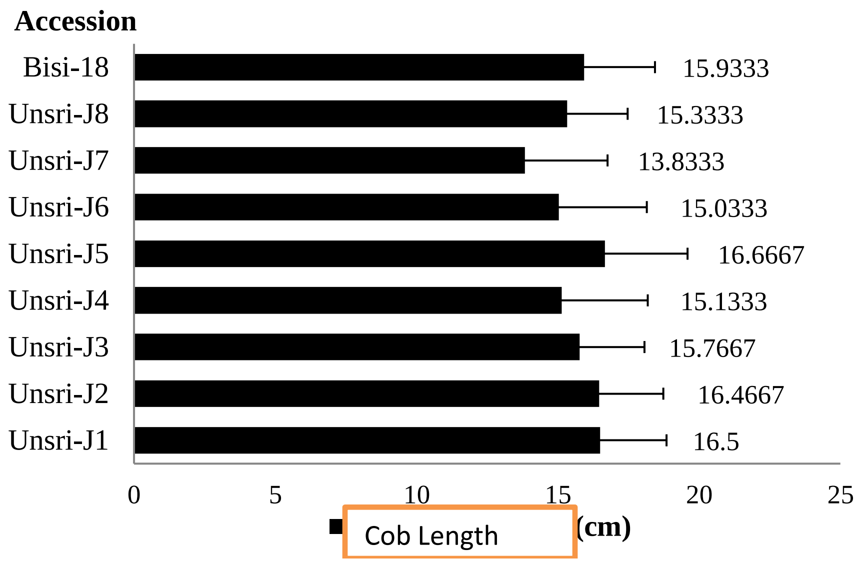


Figure 4.7. Average cob length

4.2.6. Cob Diameter (cm)

Based on the analysis of variance on the length of the cob on several accessions of maize tested, the results were not significantly different (F-count = 1.18). In (Figure 4.8.) it can be seen that the Unsri-J1 maize accession had the highest average cob diameter value of 43.1 cm, then followed by the Unsri-J2 and Unsri-J6 maize accessions with cob diameters of 42, 873 cm and 41,787. which the three accessions were higher than the Hybrid Varieties, which was 41,700cm. The lowest average cob diameter was found in the Unsri-J5 accession of 39.853cm. In the standard deviation value, the Unsri-J6 accession had a level of variance that tended to be more than the other accessions, which was 8.484281. While the accessions that had the lowest standard deviation values were the accessions of Unsri-J2 and Unsri-J8 which had the same uniformity of value, which was 0.707107.

Siswati et.al (2015) states that the character of the diameter of the cob can affect the weight of the cob produced, as the diameter of the cob and the length of the cob increases, the weight of the cob will also increase. This agrees with Bara and Chozin (2009) which states that the larger the diameter of the cob, the more seeds contained in the cob so that the weight of the beans produced is greater.

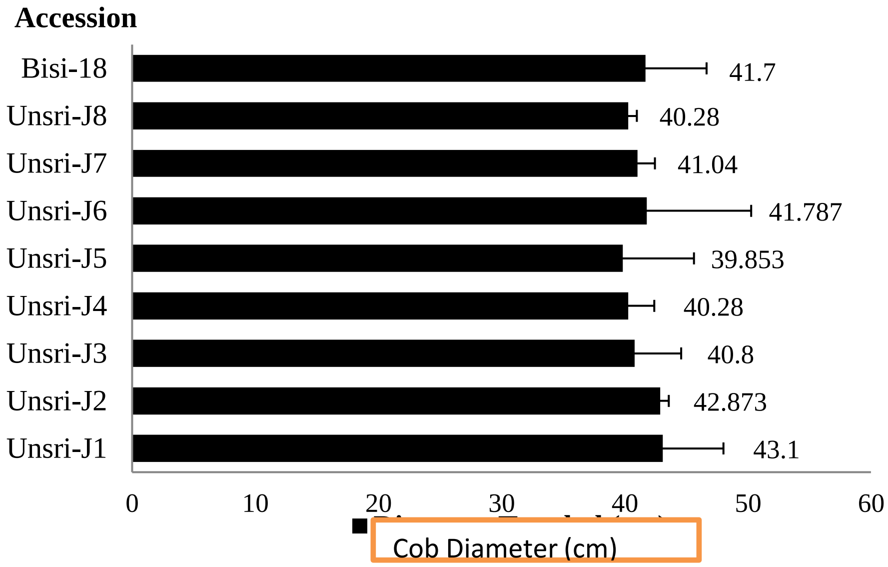


Figure 4.8. Average cob diameter

4.2.7. Male Flowering Age (Days)

The vegetative period continues until the generative period begins with the formation of flowers followed by the formation and filling of fruit, the formation of seeds, pods or the like, then ends with a ripening period (Sitompul and Guritno, 1995). The appearance of male flowers at the end of the maize plant indicates that the vegetative phase of the plant has ended and will begin the generative phase.

The results of the average flowering age in each accession (Figure 4.9.) showed the average value of the fastest flowering age in the Unsri-J1 accession, which was 48 days. While the longest average flowering age was found in the Bisi 18 hybrid maize plant, which was 62 days. This showed that in general the accession of Unsri maize plants had an early age than the Bisi 18 Hybrid Variety.

Early maturing maize varieties are needed to adjust cropping patterns in paddy fields and utilize water availability after harvest. Early-aged maize has the opportunity to avoid drought so that it can reduce the risk of crop failure (Azrai et al., 2009). Differences in male flowering time in each accession were thought to be influenced by genetic traits, environmental and climatic conditions. This is in line with the opinion of Lakitan (2012) which states that the flowering of a plant is influenced by genetic factors and the nature of the plant itself.

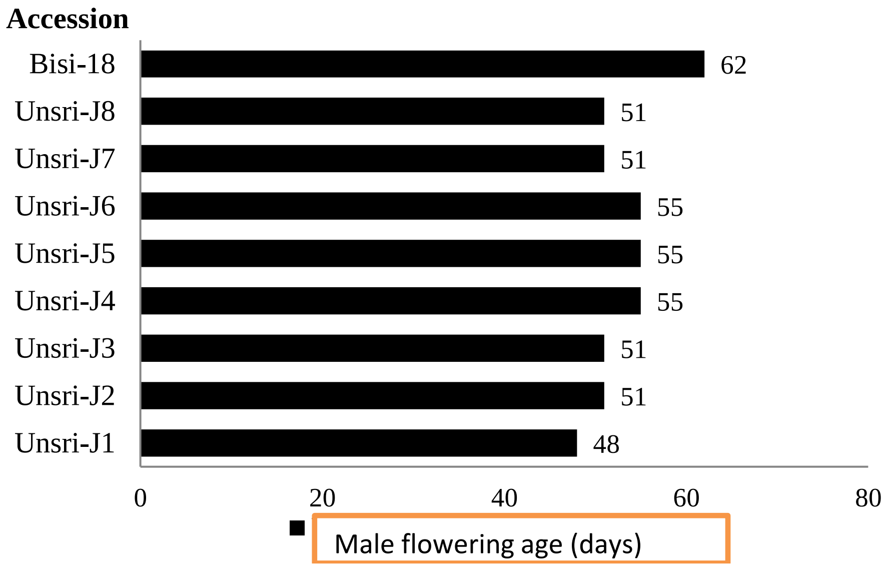


Figure 4.9. Average age of male flowering

4.3. Other Visible Characteristics

Other characteristics that were seen in the accessions and varieties of maize tested showed distinctive morphological characters of each accession and variety. The following was a description of other characteristics that appear from each of the observed variables:

4.3.1. Harvest Index (HI)

Based on the results of the study, the results were not much different between the accessions of Unsri maize and the Bisi 18 hybrid variety. The highest yield index was in the Bisi 18 hybrid variety, which was 77.54%, while the lowest harvest index was found in the Unsri-J1 accession of 57.64%. The harvest index described the proportion of photosynthate translocated into the food storage portion of the food reserve. Photosynthate produced by maize leaves was translocated to food reserves in the form of seeds. The increase in the harvest index will be followed by an increase in maize seed yield (ton ha). The higher the maize yield index, the higher the photosynthate results in the crown translocated to the seeds (Efendi dan Suwardi, 2010).

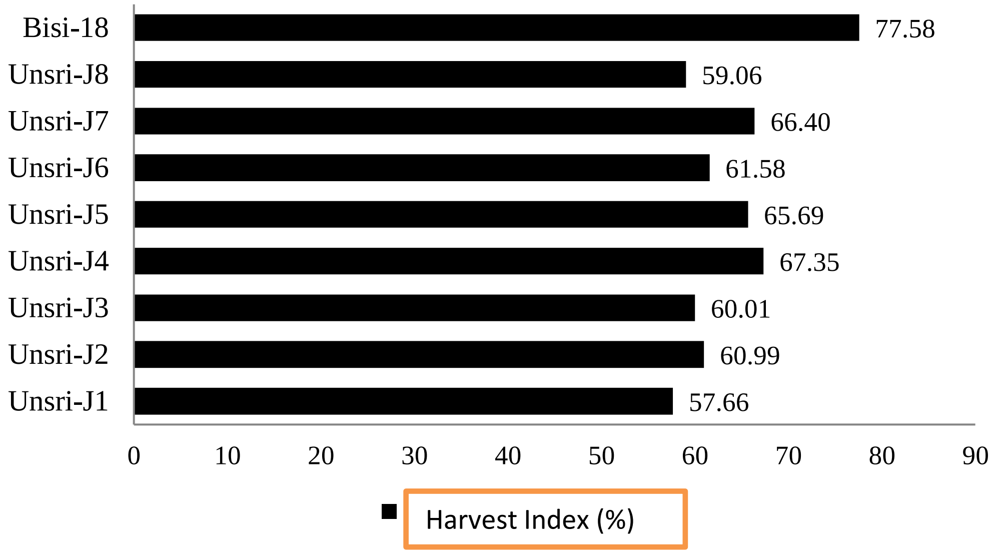


Figure 4.10. Harvest Index for each accession

4.3.2. Husk Cover

Husk cover on maize plants can affect the quality of its cobs. Maize cobs of good quality were cobs that were perfectly protected by cobs so that they can be resistant to pests and the environment that can cause damage. The results of the analysis of variance on the scores of shellfish cover on several accessions of maize tested showed results that were not significantly different (F-count = 0.94). Based on the results of observations (Figure 4.11.) it can be seen that the maize accessions Unsri-J1 and Unsri-J2 had an Average Husk Cover Score which was not significantly different from the Bisi 18 Hybrid Variety, which was 1.0667. Meanwhile, the Maize Accession which had the lowest Average Husk Cover Score compared to other accessions was the Unsri-J3 and Unsri-J5 maize accessions of 1.4. However, in general the maize accessions tested scored 1, which means that the maize husks covered perfectly.

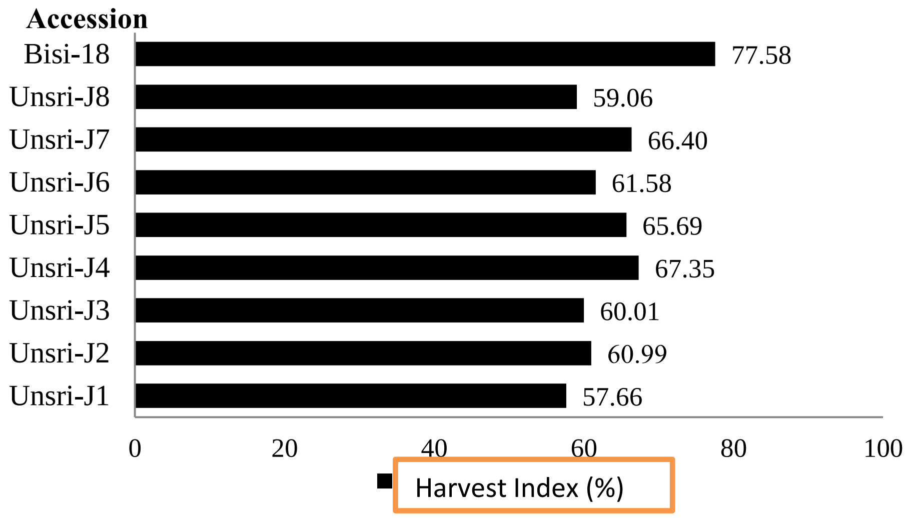


Figure 4.11. Average Husk Cover Score

4.3.3. Leaf Angle (degree)

Measurement of leaf angle was related to the ability of plants to capture sunlight. Leaf angle measurement refered to the position of the leaf relative to the plant stem. The narrower the leaf angle, the more upright the leaf sticks to the stem. The wider the leaf angle, the more open and wide the leaf will cover other leaves to catch sunlight. Based on the results of the study, it was found that the Unsri-J7 Accession had a leaf angle value of 550, meaning that the leaf was wide open. Meanwhile, Accession Unsri-J2 had a leaf angle of 200. It sticked to the stem so it did not interfere with other leaves in capturing sunlight.

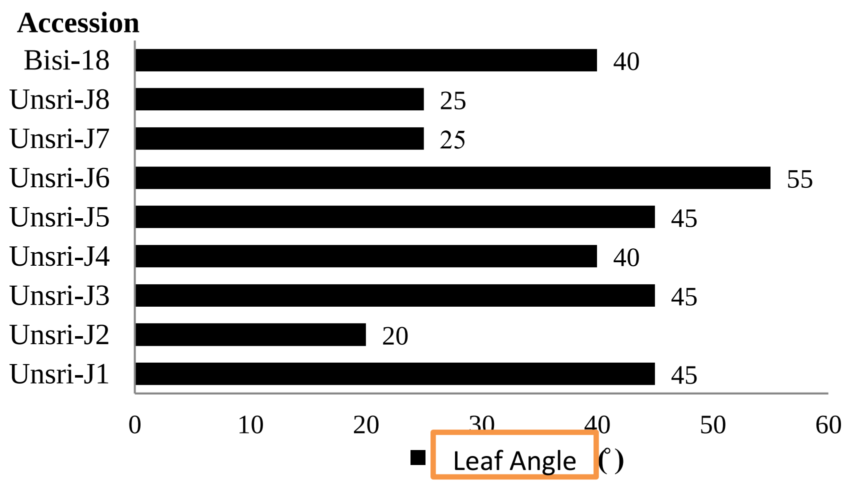


Figure 4.12. Leaf angle value for each accession

4.3.4. Leaf and Stem Base Color

The following was a comparison of leaf color and stem color between Unsri-J1 to Unsri-J8 with the Bisi-18 Hybrid variety. Based on observations, it can be seen that there were differences in leaf color between accessions and the Bisi-18, Unsri-J4 hybrid varieties had the most concentrated leaf color. In general, it can be seen that the tested accessions had darker leaf color and larger and wider leaf sizes than the Bisi-18 Hybrid variety. Leaves were an important element in plant growth related to the photosynthesis process. Dark green leaf color indicated the presence of sufficient leaf chlorophyll content in plants that affected the photosynthesis process. Surbakti et al. (2013) states that in good environmental conditions to carry out photosynthesis can produce (60-80)% of the assimilated results are translocated to other plant parts including the production organs.

In addition to leaf color, stem color in the tested accessions and the Bisi-18 Hybrid variety observed showed distinctive morphological characteristics but there were no major differences. In general, the color was green, in accessions Unsri-J1, Unsri-J2, Unsri-J4 and the Hybrid Bisi-18 variety, there was a red color at the base of the stem. While the accessions Unsri-J3, Unsri-J5, Unsri-J6 and Unsri-J7 had a green stem color without red at the base of the stem.

Unsri-J1

Unsri-J2

Unsri-J3

Unsri-J4

Unsri-J5

Unsri-J6 Unsri-J7 Unsri-J8 Bisi-18

Figure 4.13. Comparison of leaf color between accessions Unsri-J1 to Unsri-J8 with Bisi-18 Hybrid varieties

Unsri-J1 Unsri-J2 Unsri-J3 Unsri-J4 Unsri-J5

Unsri-J6 Unsri-J7 Unsri-J8 Bisi-18

Figure 4.14. Comparison of stem color between accessions Unsri-J1 to Unsri-J8 with Bisi-18 Hybrid varieties

Table 4.4. The mean value of the observed variables in each accession.

No.	Observed variables	Tested corn accession.								
		J1	**J2**	**J3**	**J4**	**J5**	**J6**	**J7**	**J8**	**B18**
1.	Plant height (cm)	221	229,27	218,87	199,3	**189**	214,6	208,6	216,87	196,73
2.	Dry Stover Weight (gram)	62,73	48,93	45,46	38,86	41,26	44,2	**34**	57,53	38,93
3.	The height of the cob (cm)	106,6 (48%)	104,46 (45%)	109,26 (49%)	89,73 (45%)	**82,86 (43%)**	102,2 (47%)	90,53 (43%)	98,807 (45%)	**77,26 (39%)**
4.	Percentage of laying down (%)	5,3	2,34	2	**0**	0,72	4,9	**0**	1,47	1,06
5.	Dry shelled weight each cob (gram)	**126,87**	126,47	107,53	99,27	108	100,93	89,47	102,27	120,27
6.	Production of dry seeds each accession plot (kg)	**25,735 /60m^2**	22,89 /60m^2	20,49 /60m^2	23,48 /60m^2	21,62 /60m^2	19,34 /60m^2	20,51 /60m^2	23,53 /60m^2	**204,8 /425m^2**
7.	Genetic potential (ton/ha)	**6,76**	6,74	5,73	5,29	5,76	5,38	4,77	5,45	6,43
8.	Weight 100 seeds (gram)	**40**	37	30	32	31	32	34	35	28
9.	Cob weight each plant (gram)	165,33	**167**	140,6	130,87	136,93	128,73	118,67	130,53	151,2
10.	Cob length (cm)	16,5	16,46	15,76	15,13	**16,6**	15,03	13,83	15,33	15,93
11.	Cob diameter (cm)	**43,1**	42,87	40,8	40,28	39,85	41,78	41,04	40,28	41,7
12.	Harvest index (%)	57,6	60,99	59,96	**67,35**	65,69	60,72	66,4	60	**77,54**
13.	Flowering age (Days)	**48**	51	51	55	55	55	51	51	48
14.	Leaf angles	45	**70**	45	50	45	35	65	65	50

CHAPTER 5
CONCLUSIONS AND SUGGESTION

5.1. Conclusions

Based on the results of this study, it can be concluded that:

1. The growth of Unsri maize accessions was generally equal or tended to be better than the Bisi-18 hybrid variety. This can be seen from the plant height which ranges from 189 cm to 221 cm, dry weight of the plant which ranges from 34 grams to 62.733 grams each plant and the height of the cob position which ranges from 82.867 cm to 109.267 cm and the flowering age was between 48 days. Up to 51 Days.
2. In terms of production, in general, Unsri maize accessions had yields equivalent to the Bisi-18 hybrid variety which had an average dry shelled value each cob between 89.47 grams to 126.87 grams. Accessions Unsri-J1 and Unsri-J2 had the highest average dry shelled values of 126.87 grams and 126.47 grams, while the Bisi-18 Hybrid variety was 120.27 grams.
3. Accessions Unsri-J1 and Unsri-J2 had production values and genetic potential, namely 6.76 tons of dry shells each hectare and 6.74 tons of dry shells each hectare were not much proportional or almost equivalent to the Bisi-18 hybrid variety, which was 6.43 tons of dry shells each hectare.
4. Accession Unsri-J5 had the lowest plant height and cob position height compared to other accessions so that the percentage of laying down was small and had the longest average length of cob.
5. The variance value of Unsri maize accessions in general was still not uniform, but in Unsri-J1 accessions the variance value was lower than some other accessions.

5.2. Suggestions

Based on the results of the study, it is recommended to choose the Unsri-J1 accession, namely the accession that has high production potential so that it can be developed further. Accession Unsri-J5 has good growth potential, but its production needs to be increased again, one of which is by adjusting the spacing.

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