"Effect of nitrogen on different varieties of fodder Maize"

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By

Tarun Sharma

(11719195)

DEPARTMENT OF AGRONOMY

SCHOOL OF AGRICULTURE

LOVELY PROFESSIONAL UNIVERSITY

PHAGWARA-144401, PUNJAB (INDIA)

SYNOPSIS

"Effect of nitrogen on different varieties of fodder maize"

Name of student : Tarun Sharma

Registration No . : 11719195

Section : H1723

Major subject : Agronomy

Major advisor : Dr. D.S.Gaikwad

CERTIFICATE

This is to certified that this synopsis entitled **"Effect of nitrogen on different varieties of fodder Maize (*Zea mays)*"** submitted in partial fulfilment of requirements for degree- Master of Science in Agronomy by **Tarun Sharma, Registration no. 11719195** to Department of Agronomy, School of Agriculture, Lovely Professional University, has formulated and finalized by the student himself on thesubject.

_____ _____

(Signature of the student)
Tarun Sharma
M.Sc. first year
Dept. of Agronomy
Reg. No.:11719195

(Signature of Supervisor)
Dr. Dhananjay S. Gaikwad
Assistant professor
Dept. of Agronomy

DECLARATION

I hereby declare that the project work entitled – **"Effect of nitrogen on different varieties of maize fodder *(Zea mays)*"** is an Project work for the award of Degree- Master of Science in Agronomy, under the guidance of **Dr. D. S. Gaikwad,** Assistant Professor, School of Agriculture, Lovely Professional University, Phagwara, Punjab,India.

Tarun sharma
(Registeration No. 11719195)

TABLE CONTENT

INTRODUCTION

Maize (Zea mays L.) is one of the most important cereal grains grown worldwide in a wider range of environments because of its greater adaptability (Kogbe and Adediran, 2003). It is mainly used as a food source and now has become the most important raw material for animal feed (Pimentel and Patzek,2005). Green fodder is an important component of livestock feed and nutrition.India counts for 15 per cent of the world's livestock population and only 2 per cent of world's geographical area resulting in tremendous animal pressure on the limited land resources. On the other hand, less than 5 per cent of total cultivated land in India is under fodder production. Accordingly, the availability of green and dry fodder is in deficit on an average to the extent of 53 percent (Hazra, 1998) which may further increase to the extent of 65 per cent in 2025. There are many ways to fulfil the deficit of fodder in India to supply green or hay to the animal. The cultivable land is occupied by major and minor cereal, oil, pulse and other crops but still vast land is uncultivated.

Maize (Zea mays L.) is one of the main source of cereals for food ,forage and processed industrial products. Maize, considered as the "Queen of Cereals" , is a C4 plant, it is capable of utilising solar radiation more efficiently even at higher radiation intensity. Maize is a rich source of starch, protein and edible oil. Maize produces good quality herbaceous fodder with high palatability. On average, it contains 9-10%CP, 60-64% NDF, 38-41% ADF, 23-25% Hemicellulose, and 28-30%Cellulose on dry matter basis when harvested at milk to early-dough stage.

World production of maize is around 790 million tones and it serves as a staple food providing more than one-third of the calories and proteins in some countries (Chulze., 2010). By 2050 demand for maize will double in the developing world, and maize is predicted to become the crop with the greatest production globally, and in the developing world by 2025(Rosegrant et al., 2008).

Maize in India, contributes nearly 9% in the national basket and more than Rs.100 billion to the agricultural GDP. In India, maize is cultivated on 9.34 million hectare with a production of 24.35 million tonnes and productivity 2583 kg/hec (Anon., 2015) mainly during kharif season, which covers 80% area. Karnataka (16.5%), Rajasthan (9.9%), Maharashtra (9.1%), Bihar (8.9%), U.P (6.1%), Madhya Pradesh (5.7%)and

Himachal Pradesh (4.4).

The maize production in Punjab in 2012-2013 was 4071 lakh metric tonnes, and the total area under the crop was 1.29 lakh hectares (department of Food Processing Punjab 2013), with an average productivity of 3,650 kg/ ha, farmers cultivating maize made substantial profits that year.

Optimal growth conditions are 18-21°C average day-temperatures, annual rainfalls of more than 750 mm, and deep, well-drained rich soils. However, maize withstands annual rainfalls ranging from 230 to 4100 mm, a pH between 4.3 and 8.7, and a great variety of soils. Frost kills the plants. Drought is detrimental at flowering as it affects pollination and impairs yields. Maize has no tolerance to flooding.

Maize is a tall, determinate annual plant producing large, narrow, opposing leaves (about a tenth as wide as they are long), borne alternately along the length of a solid stem.The stem generally attains a thickness of three to four centimetres. The inter nodes are short and fairly thick at the base of the plant, become longer and thicker higher up the stem, and then taper again. The roots of the maize plant grow very rapidly and almost equally outwards and downwards. Favourable soils may allow corn root growth up to 60 cm laterally and in depth. Corn is the most versatile crop with wider adaptability to varied agro-ecological regions and diverse growing seasons. Besides serving as human food and animal feed, the importance of this crop also lies in its wide industrial applications. In addition, corn is fed to cows, chickens and pigs, which produce milk and eggs. The processed cobs of maize find their use in the manufacture of furfurals, fermentable sugars, solvents, liquid fuels, charcoalgas

Nitrogen element is the nutrient that most frequently limits yield and plays an important role in quality of forage crops. Positive response of nitrogen fertilizers has been reported by Koul (1997), Omer (1998), Gasim (2001) and Sawi (1993). Sharma (1973) observed that addition of nitrogen fertilizer increased plant height. Increase in plant height resulted in an increase in leaf number per plant as reported by Akintoye (1996). Nitrogen fertilization increased number of leaves per plant and leaf area (El Noeman et al., 1990; Gasim, 2001). John and Warren (1967) noted that the addition of nitrogen increased stem diameter. Koul (1997) recorded that nitrogen application resulted in greater values of plant height, leaf area, number of leaves and stem diameter of fodder maize, fresh and dry forage yield were also increased due to addition of nitrogen.

OBJECTIVES

Keeping in view all these aspects the present study in fodder maize is undertaken with following objectives:

1. To study about effect of nitrogen application on growth and yield of forage maize.
2. To study the morphology of the crop under different applications of nitrogen.
3. To study about proximate composition of maize fodder.

REVIEW OFLITERATURE

Noeman *et* al.,1990;Gasim, 2001 found nitrogen fertilization increased number of leaves per plant and leaf area. John and Warren (1967) noted that the addition of nitrogen increased stem diameter. Koul (1997) recorded that nitrogen application resulted in greater values of plant height, leaf area, number of leaves and stem diameter of fodder maize, fresh and dry forage yield were also increased due to addition of nitrogen. Leaf to stem ratio was found also to be increased by nitrogen (Duncan, 1980). These findings are in full agreement with that of Gasim (2001) who reported that the increase in leaf to stem ratio with nitrogen application is probablydue to the increase in number of leaves and leaf area under nitrogen treatments, producing more and heavy leaves.

Ayub *et* al. (2003) found plants received higher N content (280 and 240 kg ha-1) produced maximum ash percentage i.e. 9.35 and 8.97%, respectively followed by plants received 200 kg N ha- 1 (8.15%). However, minimum total ash (5.27%) was recorded in control treatment followed by plants received 80 kg N ha-1 (5.80%). Ash is simply the total mineral content of forage. Present study indicated an increase in total ash percentage with the increase in N-levels which could be due to higher dry matter production in plants that contributed directly or indirectly in biosynthesis of minerals. Safdar (1997)had also reported a raise in ash contents with augment in nitrogen rate in fodder maizeand they also reported that ash percentage was significantly increased with increase in nitrogen.

M.U Ahmed *et* al(1999) found nitrogen levels had significantly affected leaf area of maize plant and the effect of phosphorus was found not significant. The probable reason of our result might be that N increase vegetative growth while P brings maturity in plant. These are in confirmation with those of Khan, M.A., Khan, M.U., Ahmad ,K. and Sadiq ,M. (1999) Ayub,M.,

Nadeem *et al.*(2002)who reported that leaf area increased with increase nitrogen and phosphorus levels. Harvesting time also significantly affected the leaf area plant-1. The plots harvested60 days after sowing produced significantly more leaf area plant-1than earlier harvesting times. Minimum leaf area was observed when crop was harvested 40 days after sowing.

Musa *et al.*(1993) had also reported a significant increase in the leaf area plant-1with delaying the harvest. Nitrogenous fertilizers are effective in increasing the performance and impact of the increase in grain protein.

(Kazemi, 1999)nitrogen application is a good way to increase the yield of corn (Norwoodd,2000;wienholdetal,1995), but its mismanagement of water will contaminate the product.

Ritchie *et* al, 1993 a high proportion of nitrogen and phosphorus in the grain is transported in to the shoots that will be harvested. Ghasemi and colleagues (2002) reported that grain weight and grain yield of maize were affected by different amounts of nitrogen. El-Sheikh(1998) reported that application of 160 kg N ha significantly increased the number of grains per ear and yield.

Muchow, 1988; Muchow and Davis, (1988) Optimum rate of nitrogen fertilizer for

forage maize cultivation depends on numerous variable factors such as environmental conditions, management systems and genotypes. Nitrogen fertilization of maize influences dry matter yield by influencing leaf area index, leaf area duration and photosynthetic efficiency (Muchow, 1988; Muchow and Davis, 1988).

O'leary and Rehm (1990) reported that forage dry matter yields of maize responded linearly to nitrogen rates at three sites and curvilinearly at five sites. Likewise, these researchers determined that forage quality traits such as NDF and ADF responded inconsistently to nitrogen rates.

Ayub et al.(2000 and2002) green fodder yield was increased with increased nitrogen, Plants fertilized with 120kg N ha" produced Significantly more green fodder yield than those fertilized with 80 kg N ha" and control. Increase in green fodder yield with increased nitrogen was mainly associated with greater plant height, number of leaves plant" and stem diameter.

Nitrogen element is the nutrient that most frequently limits yield and plays an important role in quality of forage crops. It is almost deficient in most soils of Africa and most of the tropics (Jules, 1974).

Positive response of nitrogen fertilizers has been reported by Koul (1997), Omer (1998) Gasim (2001) and Sawi (1993). Sharma (1973) observed that addition of nitrogen fertilizer increased plant height. Increase in plant height resulted in an increase in leaf number per plant as reported by Akintoye (1996).

A field trial was conducted to determine the effect of different Nitrogen rates on yield and quality of maize at Agronomy Research Farm (ARF), The University of Agriculture Peshawar-Pakistan during summer 2016. Four nitrogen treatments (70, 130, 160 and 180 kg ha-1) and a control one were studied in this trial. Maximum Growth and yield traits and quality such as plant height (210.23cm), stem diameter (3.68cm), leaf area plant-1 (210.5cm-2), chlorophyll content (39.78%), green fodder yield (44.89 ton ha-1), dry matter yield (9.1 ton ha-1), crude protein (10.75%), crude fiber (31.87%) and ash percentage (8.85%) were recorded. It was concluded that increasing nitrogen levels (130, 160, and 180 kg N ha-1) at optimum level can give a maximum growth and yield traits and quality of maize.

The study was conducted for two consecutive seasons 2010/2011 and 2011/2012 at the Demonstration Farm of the college of Forestry and Range Sciences, Sudan University of Science and Technology, Soba Khartoum .the aims of this study was to evaluate the effect of nitrogen fertilization levels on forage maize as a potential winter crop in central Sudan in terms on biomass yield. Three nitrogen fertilization levels were examined. The treatments were arranged in a Randomized Complete Block Design (RCBD) with four replicates. Parameters studied were plant density, plant fresh weight (g), plant dry weight (g), and forage yield (tons/ha). Results obtained reveal that application did not significant affect forage plant density. Application of nitrogen increase fresh and dry weight per plant in all counts .fresh forage yield in terms of fresh forage and dry matter production was

significantly increased with application of nitrogen .It was concluded that application of nitrogen fertilizer increase yield of forage maze during the winter season in central Sudan.

A Khan *et* al noted nitrogen (N) and phosphorus (P) are of the most important and complex nutrients for the crop plants in particular for grain yield and quality. The field trials were laid out in randomized complete block design having three replications. Research trial plots were located at Agricultural Re-search Farm of Agricultural University Peshawar (Ameer Mohammad Khan Campus Mardan) during kharif season in 2012 to investigate the response of maize variety (Jalal) to three phosphorus rates (60, 90 and 120 kg·ha−1) and four nitrogen rates (90,120,150,180 kg·ha−1) for agronomical traits. These traits investigated included number of plant per m2(NP m2), plant height (PH), number of leaves plant−1(NLP), leaf area plant−1·cm2 (LAP), fresh weight of plants kg·ha−1(FW) and dry weight of plant kg·ha−1(DW), were investigated. Results of the study showed that application of N @ 180 and P @ 120 kg·ha−1significantly increased fodder yield of maize. The linear increase in biomass yield clearly indicated that N was a limiting nutrient factor and that N demand along with P has a positive response. At higher application rates, N fertilizer significantly increased biomass component, improved N uptake with increasing nitrogen use efficiency and decreased its losses to the environment and below plant zone. So this study showed that the phosphorus and nitrogen fertilizers have a positive effect on the fodder yield of maize.

MATERIAL ANDMETHODS

Location - The experiment is conducting at the main Experiment Station, Department of Agriculture, Lovely Professional University, Phagwara, Punjab, located at latitude of 31.2498190 and longitude of75.7084550 as map coordinates along with altitude of 232 m above sea level.

Climate: In Punjab generally temperature ranges 21-36 degree C from March – June which is suitable for growing maize.

Soil: The soil status of experimental site is sandy loam soil, well fertile and free from weeds and well tilth soil. Has good drainage and rich in nutrients. The soil experimental field was sandy loam in texture, acidic in reaction with low level of organic carbon, available nitrogen and available P2O5 but medium level of available K2O.

Year and Session of Experiment - January 2018, session -2018-19

Material -2

1. J1006
2. African tall

Experimental design: Random block design (RBD)

Number of replication: 4

Size of plot: 500 m^2

Size of each plot:5x3 m^2

Number of varieties hybrids: 2

Number of plots: 32

Number of treatments: 08

Treatments	Details
T_1	No dose of fertilizer (Control) (variety 1)
T_2	Recommended dose of fertilizer (Variety 1) (275kg/ha)
T_3	75% dose of fertilizer and 25% from FYM
T_4	50% dose of fertilizer and 50% from FYM
T_5	No dose of fertilizer (Control) (variety 2)
T_6	Recommended dose of fertilizer (variety 2) (275kg/ha)
T_7	75% dose of fertilizer and 25% from FYM
T_8	50% dose of fertilizer and 50% from FYM

LAYOUT

CHANNEL			CHANNEL			CHANNEL
	T1	**T3**		**T4**	**T8**	
	T2	**T4**		**T3**	**T7**	
	T3	**T7**		**T2**	**T6**	
	T4	**T8**		**T1**	**T5**	
	T5	**T6**		**T8**	**T1**	
	T6	**T5**		**T7**	**T2**	
	T7	**T1**		**T6**	**T3**	
	T8	**T2**		**T5**	**T4**	

OBSERVATIONS TO BE RECORDED:

Data will be recorded for the following

Morphological parameters:

(Randomly from 5 plot)

1. Plant height (cm) up to 30 days, 50 days, and 70days
2. Stem girth (cm) up to 30days, 50 days, and 70days
3. Numberof leaves up to 30 days , 50 days and 70 days
4. Stem weight and leaf weight per plant

Soil parameters: (before sowing and at harvest)

1. PH
2. NPK content
3. Organic carbon

Yield components and yield:

1. Fodder yield (kg/ha)

Proximate Composition:

1. Dry matter(%)
2. Crude Fiber(%)
3. Ether Extract (%)
4. Crude Protein (%)
5. Nitrogen Free Extract (%)
6. Ash (%)

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