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Research paper

Effect of Sowing Method on Growth and Yield of Maize (*Zea mays* L.) Under High Terrace Soil in River Nile State, Sudan

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ABSTRACT

This study aims to investigate the effect of two type of sowing method on growth and yield of maize (Zea mays). A randomized complete block with three replications was used to execute the experiment. The results showed that sowing methods did not differ significantly in plant height and leaf area of maize in both seasons. The results revealed that sowing on flat increased significantly yield and yield components of maize in both seasons compared to ridge sowing. The result of this study showed that sowing on flat produced 12% more grain yield compared to ridges in both seasons.

Keywords: Maize, flat, ridge, yield.

تأثير طريقة الزراعة على نمو وإنتاجية الذرة الشامية في أراضي التروس العليا بولاية نهر النيل بالسودان

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تهدف هذه الدراسة لمعرفة أثر نوعين من طرق الزراعة على نمو وإنتاجية الذرة الشامية. استخدم تصميم المربعات كاملة العشوائية بثلاثة مكررات. أوضحت النتائج أنه لا توجد اختلافات معنوية بين طرق الزراعة في طول النبات والمساحة الورقية للذرة الشامية في الموسمين. أظهرت النتائج أن الزراعة في الأرض المسطحة أدت إلي زيادة معنوية في الإنتاجية ومكونات الإنتاجية للذرة الشامية في الموسمين مقارنة بالزراعة على السرابات. وأوضحت نتائج هذه الدراسة أن إنتاجية الحبوب للأرض المسطحة أعلى بأكثر من 12% مقارنة بالسرابات في كلا الموسمين.

كلمات مفتاحية: الذرة الشامية، الأرض المسطحة، السرابات، الانتاجية

Introduction

Maize (*Zea mays* L.) is one of the important forage crops that has the greatest impact on the improvement of animal production worldwide. It is the world third leading cereal crop after wheat (*Triticum aesitivum*) and rice (*Oryza sativa*). The crop is used as primary stable human food and widely as an irrigated fodder in many tropical and subtropical countries (Suttie, 2000). It is widely used as forage and feed crop for animals in USA and temperate regions (Fisher and Palmer, 1984). In Sudan, maize is grown as subsistent rain-fed crop around villages in Nubba Mountains (Gubraka farming), the Blue Nile and South parts of Sudan. The crop is also, grown under irrigation in central, eastern and northern Sudan. In the last two decades, maize gained more importance as a forage and a food crop and the total cultivated area was increased and estimated at about 169000 ha (FAO, 2003). In fact, the average grain yield of maize in Sudan (750 Kg/ha), is very low compared with 7471 Kg/ha of the world (FAO, 2003). The crop has a high potential, being grown during both summer and winter seasons for grain and forage yields. One way can be used to improve its irrigation intervals. However, maize is known to be a relatively water demanding crop (Ranzom *et al*, 2004). Maize can be grown successfully in variety of soils ranging from loamy sand to clay loam. However, soils with good organic matter content having high water holding capacity with neutral pH are considered good for higher productivity. Therefore, the present study was an attempt to evaluate the effect of sowing methods on growth and yield of maize under high terraces soil.

Materials and Methods

The experiment was carried out during the seasons 2014/15and 2015/16 at the Demonstration Farm of the Faculty of Agriculture, Nile valley University in Dar Mali, River Nile state (latitude 17º 48- N, longitude 34º 00- E and 346.5 m above sea level). The soil of the experimental site (high terraces) is heavy clay (58.67%) alkaline (PH 8.8) with low permeability.

The treatment consisted of two types of sowing methods flat and ridge (F versus R). The experimental design was randomized complete block with three replications. The plot size unit was 3×5 m with five rows or ridges per plot. The seeds of the local variety were sown on the 15th of November in both seasons at the rate of 20 kg/feddan. Two to three seeds were sown per hole at 25cm spacing between holes and 60cm between rows on ridges and flat sowing. The ridge height was about 25cm and the sowing was done half way between the top and the bottom of the ridge.

Vegetative, reproductive and yield parameters include the plant height, leaf area, number of cobs per plant, number of seeds per cob, 100 seed weight and seed yield. Plant height was measured 15, 30, 45 days after sowing and at harvest. Leaf area was calculated using the formula: Leaf area = leaf length x leaf width x 0.74 as reported by Watson and Watson (1953). Seed yield was determinate by collecting seeds from an area of o.7m^2 for each treatment, and the total seed yield per hectare was estimated. Data were analyzed using the Statistical Package for Social Sciences (SPSS) and means were separated using the least significant difference (LSD) (Gomez and Gomez, 1984).

Results and Discussion

In both seasons, sowing methods show the same results on growth attributes, plant height and leaf area of maize. Sowing on flat consistently increased plant height during both seasons except for the first and the second readings of the first season (Table1). Ridge sowing produced higher leaf area compared to sowing on flat during both seasons (Table2). Furthermore, sowing the crop on ridges produced 4 and 8% more leaf area index compared to flat. Similar results were reported by Abusuwar (1994) on sorghum, Abusuwar *et al.* (1999) on alfalfa, Abusuwar and Abdalla (2001) and Abusuwar and Abdalla (2004) on clitoria. The effect of sowing methods on yield components and seed production was consistent in both seasons. Sowing on flat compared to ridges sowing significantly increased number of cobs per plant, number of seeds per cob, 100 seed weight and seed yield in both seasons (Table3). The increase in seed yield of flat sowing could be attributed to efficient utilization of resources in flat sowing by the crop plant compare to ridges. Similarly, result by El toum (2016) found that flat sowing increase significantly yield of maize when sown in Northern State of Sudan compared to ridge sowing.

In this study, sowing maize crop on flat performed better in growth and yield compare to ridge sowing.

Table (1): Effect of sowing methods on plant height (cm) of maize during seasons 2014/15 and 2015/16.

Season	**1st**				**2nd**			
Days after sowing / **Treatment**	**15**	**30**	**45**	**At harvest**	**15**	**30**	**45**	**At harvest**
Flat	48.20	89.73	128.70	131.50	23.20	80.40	135.30	165.70
Ridge	65.53	121.73	126.53	126.70	22.10	78.20	130.10	160.20
C.V	10.10	29.50	12.70	9.28	13.60	18.30	8.10	11.30
LSD	20.02	10.37	57.00	42.11	2.20	6.30	8.10	7.10

Table (2): Effect of sowing methods on leaf area index.

Season / Treatment	1st	2nd
Flat	730.00	415.50
Ridge	764.00	451.10
C.V	6.95	7.70
L.S.D	115.60	129.70

Table (3): Effect of sowing methods on yield and yield components.

Character	No. of cobs/ plant		No. of seeds/ cob		100seed weight(g)		Seed yield (Kg/ha)	
Season / Treatment	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Flat	1.20 a	1.40 a	455.00 a	281.97 a	25.53 a	22.00 a	814.20 a	829.4a
Ridge	1.06 b	1.20 b	380.00 b	269.07 b	22.29 b	21.70 b	714.10b	728.0b
C.V	31.40	18.50	11.36	15.50	3.15	3.10	25.00	26.7
LSD	0.08	0.15	49.90	11.50	1.62	0.23	80.09	100.3

Means followed by the same letter (s) in each column are not significantly different at probability 5%.

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