Dedication

To soul of my Father

To my Mother

Sisters and Brothers

My Wife and Daughters: Aasha & Afraa
Acknowledgment

First, of all I am grateful to Almighty Allah For his great blessing. My sincere thanks and gratitude to my Supervisor Dr. Elsadig Al-Mahdi, for encouragement help, guidance and continued support. More thanks to Co-Supervisor Professor. Sami Mohammed Tambal. Due thanks are extended to the staff of the Department of Agricultural Engineering, College of Agricultural Studies Sudan University of Science and Technology. Thanks are also due to the staff of College of Agricultural Science Dongola University.
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LIST OF ABBREVIATIONS

ARS  Agricultural Research Service
B.C  Before century
BF  Beginning flower stage
CT  Conventional tillage
CWR  Crop water requirement
DAS  Day after sowing
ET_a  Actual evapotranspiration
ET_c  Crop evapotranspiration
FAO  Food and agriculture organization
FB  Flower bud stage
Ha  Hectares
HI  Harvesting index
HYV_s  High yield varieties
ABSTRACT

A field study was conducted to known the effect of three tillage types (harrowing, disking, chiseling and control (zero tillage)) and two sowing methods (Ridge and flat) and irrigation water levels (100%ETc, 85% ETc and 75% ETc) on sunflower crop (*Helianthus annuus* L.) hybrid hysun33 in summer season during (2011- 2012) in Faculty of Agricultural Science farm, University of Dongola, Northern State by

A two-year field experiment was carried out using a strip-split plot arranged in randomized complete block design
with four replications in two seasons 2011 – 2012. Recognized standard methods were used for assessing yield, vegetative growth, soil physical properties and field :water regimes. Results can be summarizing as follows

Significant differences in yields were obtained at 100%ETc irrigation water levels. This indicates the sensitivity of the crop to water stress. Analysis of variance, in both seasons, showed significant differences due to tillage treatments. The highest values in yield were obtained under harrowing treatments and lowest values were obtained under no-tillage treatment. This may be attributed to the fact that sunflower plant is a tap rooted plant that penetrates well in tilled soils. The number of seed per head was not affected by tillage treatments, water stress and sowing methods. It seems that these characters are genetically .control rather than environmentally affected

Sunflower is well known for its empty seeds problem. 100% ETc irrigation water level showed no improvement in the reduction of the number of empty seeds, but, on the reverse the number of empty increased. This implies that the number of empty seeds phenomenon is associated with level of irrigation at a certain growth stages of the plant life duration. On the other hand there was no .significant difference due to sowing methods

Full 100%ETc should be given to the crop to get maximum yield. Empty seeds should be studied under different .deficit irrigation levels at mid stage of plant growth
الخلاصة

أجريت هذه الدراسة لمعرفة تأثير ثلاثة عمليات حراثية مختلفة (المشط الفرضي الثقيل، محراث فرضي ومحراث حفاض) بالإضافة إلى ارض غير محروثة كشاهد وطريقتين للزراعة (احواض مسرية واحواض مسطحة) وثلاثة مستويات مياه مختلفة (الري بالعجز، 100%)
85% و75% من الاحتياج المائي للمحصول على محصول زهرة الشمس (Helianthus annuus L) الصنف هاي ص 33 في الموسم الصيفي لموسمين متتاليين (2011 - 2012) بمزرعة كلية العلوم الزراعية - جامعة دنقلا - الوزارة الشمالية بتصميم القطع المنشقة - المشتقة بتوزيع القطاعات العشوائية الكاملة مع 4 مكررات لموسمين. تم استخدام طرق قياسية لأخذ قياسات الانتاجية، تطور النمششو، التربة وكمية مياه الري يمكن تلخيص النتائج فيما يلي.

أظهرت النتائج فروقات معنوية في الإنتاجية بمستوى مياه ري 100% من الاحتياج المائي للمحصول وكان ذلك مؤشر واضح لحساسية المحصول للشدو العملي. أيضاً تحليل التباين في الموسمين اظهر فروقات معنوية نتيجة لعمليات الحراثة المختلفة وقد حققت الفروقات في النمط القروصي الثقيل اعلي قيمة للإنتاجية وكانت الإنتاجية بالأرض الغير محروقة متدنية وهذا يرجع الى ان محصول زهرة الشمس له جذوره وتدية تختبر التربة المحروقة بسهولة. بينما نجد ان عدد البذور في القرص لم يتأثر بالمعاملات المختلفة وبدو ان هذه خاصية محكومة وراثياً ليس للعوامل البيئية أي تأثير فيها.

معروف ان محصول زهرة الشمس بها مشكلة البذور الفارغة وانتشار النتائج الا ان معاملة مياه الري ETc100% لم تظهر أي تحسن في تقليل نسبة البذور الفارغة بل علي العكس فقد اعطلت نسبة أكبر مقارنة مع معاملات الري الاخرى. وهذا يشير الى ان مشكلة نسبة البذور الفارغة مرتبطة بكمية مياه الري في مرحلة محددة من دوره حياة المحصول. على صعيد آخر لم تظهر أي فروقات معنوية بين الزراعة بالحواض السطحية والاوحاض المستوية. معاملة مياه الري ETc100% من الاحتياج المائي للمحصول اعطى إنتاجية عالية ويمكن معالجة مشكلة البذور الفارغة وذلك بدراسة اثر الري بالعجز لمراحل النمو الوسطي المحصول.