

**EFFECTS OF SOWING DATE ON DAYS TO FLOWERING, YIELD AND GRAIN
QUALITY OF SORGHUM (*Sorghum bicolor* L. Moench) IN THE NILE CORRIDOR
REGION OF SOUTH SUDAN**

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**A Thesis Submitted to Graduate School in Partial Fulfilment of the Requirements for
the Master of Science Degree in Agronomy of Egerton University.**

EGERTON UNIVERSITY

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DECLARATION AND RECOMMENDATION

Declaration

I declare that the information presented in this text is my original work and no part has ever been submitted for an award of a degree in any University.

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DEDICATION

This thesis is dedicated to, my parents Mr. and Mrs. Kok, my wife Rebecca and my daughters Jemimah, Esther and Tiffany for their perseverance, love and support during my entire study period.

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ABSTRACT

Sorghum (*Sorghum bicolor* (L.) Moench) is an important crop in the arid and semi-arid lands (ASALs) where moisture is limited and rainfall is erratic. Late sowing, poor yields and lack of adequate nutrition are consistently a problem in South Sudan. The objectives of the study were to 1) determine the effect of sowing date on morphology and yield of sorghum varieties, 2) determine the effects of sowing date on protein, tannins, iron and zinc content of sorghums and 3) identify high yielding sorghum varieties. A field study was conducted under rain fed conditions in Bor and Arek locations of South Sudan. Five varieties; Beer, Akuorachot, Dhet, Agany and Seredo were sown on 18th June, 29th June and 10th July in Bor and Arek locations. The experiment was 2 × 3 × 5 factorial treatments laid out in a randomised complete block design with three replications. Leaf area index, days to flowering, plant height, aboveground biomass, grain yield, harvest index and thousand seed mass were recorded. Laboratory grain quality analyses to determine protein, tannins, iron and zinc contents were conducted. Significant site by variety by sowing date interaction was recorded for leaf area index, days to flowering, plant height, aboveground biomass, grain yield, harvest index and thousand seed mass. At Bor, 18th and 29th June sowing dates recorded mean grain yield of 1.46 and 1.44 t ha⁻¹ but the difference was not significant. However, low yield of 1.15 t ha⁻¹ was obtained for 10th July sowing date. At Arek, 18th June, 29th June and 10th July sowing dates achieved mean grain yield of 2.60, 2.48 and 2.58 t ha⁻¹ but were not statistically different. Variety Akuorachot out yielded other varieties with sites combined overall mean of 2.7 compared to Dhet and Beer with sites combined overall means of 2.36 and 2.18 t ha⁻¹ respectively. Significant positive correlations were recorded between yield and leaf area index, plant height, harvest index and thousand seeds mass. Grain protein content of 11.55 % was achieved for 29th June sowing date in Bor and 11.40 % for 18th June sowing date in Arek. Varieties sown on 18th June had tannin content of 1.19 mg mL⁻¹ while those sown on 10th July had tannin content of 1.49 mg mL⁻¹. Tannin level was 1.37 mg mL⁻¹ in Bor but 1.24 mg mL⁻¹ in Arek. Iron and zinc content was higher for 18th and 29th June sowing dates compared to 10th July sowing. Beer and Dhet were high in protein; Dhet and Seredo were high in iron and zinc while Seredo and Akuorachot were high in tannin content. Inherent variety effect, location and choice of sowing date have associated effects on yield and grain quality of sorghum varieties. Therefore, when Dhet and Akuorachot varieties are sown in June sowing dates yield and grain quality are enhanced.

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LIST OF ABBREVIATIONS AND ACRONYMS

AGBM	Aboveground dried biomass
ANOVA	Analysis of variance
ASALs	Arid and semi-arid lands
BHEARD	Borlaug higher education for agricultural research and development
CE	Catechin equivalent
CGR	Crop growth rate
FAO	Food and Agriculture Organisation
ICRISAT	International crop research institute for the semi-arid tropic
IFPRI	International food policy research institute
ITCZ	Inter-tropical convergent zone
FAO	Food and agriculture organization
m.a.s.l	Metres above sea level
NAR	Net assimilation rate
ppm	Parts per millions
UPGMA	unpaired group mean linkage cluster analysis.
USAID	United States agency for international development
WHO	World Health Organisation
WFP	World food program

