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**FACULTY OF AGRICULTURE AND ANIMAL SCIENCES  
DEPARTMENT OF CROP PRODUCTION AND MANANAGENT**

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**EFFICACY OF SULPOW 800 WG IN THE MANAGEMENT OF SCAB DISEASE OF  
COWPEA**

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**BY**

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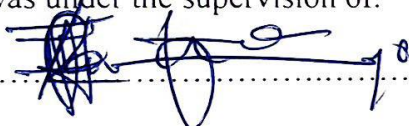
**DECLARATION**

I, **AGUTI MARTHA** declare that this research report is my original work, the findings have never been presented to Busitema University or elsewhere for the award of any academic qualification, I hereby affirm that except for references to other people's works, which have been duly cited, this work is a result of my own research and that it has not been presented in part or whole for any other degree in this University or elsewhere.

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*Photo 2: Aguti Martha collecting data*

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## LIST OF ACRONYMS

<b>KG</b>	Kilogram
<b>ANOVA</b>	Analysis of Variance
<b>NaSARRI</b>	National Semi-Arid Resources Research Institute
<b>Cm</b>	Centimetre
<b>Ha</b>	Hectare
<b>FAO</b>	Food, Agricultural Organisation.
<b>IITA</b>	International Institute of Tropical Agriculture
<b>oC</b>	Degree centigrade
<b>DAP</b>	Days after planting
<b>CCRP</b>	Collaborative Crops Research Project
<b>M.a.s.l</b>	Meter above sea level.
<b>M</b>	Metre
<b>AUDPC</b>	Area under Disease Progress Curve
<b>CMV</b>	Cucumber Mosaic Virus
<b>CABMV</b>	Cowpea Aphid Borne Mosaic Virus
<b>CPMMV</b>	Cowpea Mild Mottle Virus
<b>CPSMV</b>	Cowpea Severe Mosaic Virus
<b>SECOW</b>	Serere cowpeas
<b>CV</b>	Coefficient of Variation
<b>LSD</b>	Least Significant Differences.

## ABSTRACT

Cowpea is one of the most important legume food crops in Uganda. However, grain yields as low as 400 kg ha<sup>-1</sup> have been recorded in farmers' fields despite a grain yield potential of 3,000 kg ha<sup>-1</sup>. Cowpea scab is a major production constraint, causing yield losses of up to 100%. The main interest of this study was to contribute to the management of cowpea scab disease in farmer's field so as to enhance sustainable production of cowpea towards food security and poverty alleviation among the resource poor and small holder farmers in Uganda. It is on this account that a study was conducted for two seasons (2022B and 2022BB) to test the efficacy of a new fungicide, Sulpow to determine its efficacy in controlling scab disease in cowpeas. Experiments were set in a randomized complete block design with three replications and five treatments (Sulpow 1.5g/L, Sulpow 1g/L, Sulpow 0.5g/L, Ascosulfur (positive check and commonly used fungicide) and Non-treated plots (negative check). The analysis of variance showed significant differences ( $p < 0.05$ ) for grain yield, scab severity, incidence, and area under disease progress curve (AUDPC) among treatments, seasons, and for treatment by season's interactions. The mean grain yield of 865.16 kg/ha was recorded across all treatments. Sulpow 1.5g/L was ranked as the best performing with the grain yield of 1766.9 kg/ha followed by Sulpow 1g/L with grain yield of 1757.9 kg/ha and 18.00g 100- seed weight, Ascosulfur with grain yield of 345.7 kg/ha and 15.82g 100- seed weight, Sulpow 0.5g/L with grain yield of 302 kg/ha and 14.73g 100- seed weight while the negative control was the lowest performing with grain yield of 152kg/ha and 14.32g 100 seed weight. The season's performance was as follows: the grain yield of 853 kg/ha was recorded in the first season and 877.6 kg/ha was recorded in the second season. The highest grain yield of 1746 kg/ha followed by 1730 kg/ha were recorded in Sulpow 1.5g/L and Sulpow 1g/L treatments respectively in the first season while the second season, the highest grain yield of 1787.8 kg/ha and 1785.2 kg/ha were recorded in sulpow 1.5g/L and Sulpow 1g/L treatments. I recommend the use of Sulpow as another fungicide for controlling scab disease of cowpea plants and to make economic sense and avoid wastage, the fungicide should be applied at 1g/L because it performed the same with 1.5g/l and was as well showed a significant difference in its performance with the already existing fungicide (Ascosulfur).



# CHAPTER ONE

## INTRODUCTION

### 1.1 Back ground

Cowpea (*Vigna unguiculata* (L.) Walp.;  $2n = 2x = 22$ ) is one of the most important food and forage legumes grown in the semi-arid tropics and some temperate regions of the world (Afutu *et al.*, 2017). It is farmed in more than 60 nations, either as a food crop or a cash crop, and is found in regions of Southern Europe, Southern America, Southern Africa, Asia and Oceania, the Middle East, and Africa (Afutu *et al.*, 2017). The crop's primary region of production is Africa, where low input agriculture is prevalent over most of the continent (Afutu *et al.*, 2017). For the people of northern and eastern Uganda, where roughly 90% of the country's crop is cultivated, cowpea provides a crucial source of protein (Adipala *et al.*, 1999). The dry grains, green pods, and leaves are eaten. Low input conditions are used to cultivate the crop, and the average annual grain production is less than 500 kg/ha (Adipala *et al.*, 1999). For a variety of reasons, cowpea is one of the most favored crops and an important part of the farming systems of the majority of resource-poor rural households in SSA (Afutu *et al.*, 2017). The protein content of cowpea grain is substantial (19 to 35%) and contains a lot of lysine and tryptophan, two important amino acids. Cowpea grain has a high protein content (19–35%) that is particularly abundant in the important amino acids lysine and tryptophan (Horn *et al.*, 2020). Two important amino acids, lysine and tryptophan, are abundant in the high percentage of protein (19–35%) found in cowpea grain (Horn, 2020; Abadassi, 2015; Ibro *et al.*, 2014). Through its contributions to their nutritional security, income production, and soil fertility enhancement, it strongly supports the livelihood of small-scale farmers. On roughly 14.5 million hectares, approximately 6.5 million metric tons of cowpeas are produced each year worldwide (Boukar *et al.*, 2019).

Worldwide about 6.5 million metric tons of cowpea are produced annually on about 14.5 million hectares Nigeria being the world's largest producer and consumer, followed by the Niger Republic and Burkina Faso (Boukar *et al.*, 2019; Labuschagne *et al.*, 2022). Cowpea production is dominated by Sub-Saharan Africa, which has a 96% (4.9 million tons) area share globally (Mekonnen & Labuschagne, 2022; Horn & Shimelis, 2020b). West Africa is the major cowpea producing region in Sub-Saharan Africa (SSA), where Nigeria and Niger stand first and second

## REFERENCES

- Abadassi, J. (2015). Cowpea (*Vigna unguiculata* (L.) Walp.) Agronomic Traits Needed in Tropical Zone. *Justin Abadassi Int. J. Pure App. Biosci*, 3(4), 158–165. [www.ijpab.com](http://www.ijpab.com)
- Aboki, E., & Yuguda, R. (2013). *Determinant of Profitability in Cowpea Production in Takum Local Government Area of Taraba State , Nigeria*. 4(1), 33–37.
- Adegbite, A. A., & Amusa, N. A. (2010). The major economic field diseases of cowpea in the humid agro-ecologies of south-western Nigeria. *Archives of Phytopathology and Plant Protection*, 43(16), 1608–1618. <https://doi.org/10.1080/03235400802677768>
- Adipala, E., Omongo, C. A., Sabiti, A., Obuo, J. E., Edema, R., Bua, B., & Ogenga-Latigo, M. W. (1999). Pests and diseases of cowpea in Uganda: Experiences from a diagnostic survey. *African Crop Science Journal*, 7(4), 465–478. <https://doi.org/10.4314/acsj.v7i4.27740>
- Afutu, E., Agoyi, E. E., Amayo, R., Biruma, M., & Rubaihayo, P. R. (2017). Cowpea scab disease (*Sphaceloma* sp.) in Uganda. *Crop Protection*, 92. <https://doi.org/10.1016/j.cropro.2016.06.024>
- Afutu, E., Agoyi, E. E., Kato, F., Amayo, R., Biruma, M., & Rubaihayo, P. R. (2016). *Morphological Characterization of Ugandan Isolates of Sphaceloma sp . Causing Cowpea Scab Disease*. 8(9), 55–70. <https://doi.org/10.5539/jas.v8n9p55>
- Afutu, E., Mohammed, K. E., Odong, T. L., & Biruma, M. (2016). *Evaluation of Ugandan Cowpea Germplasm for Yield and Resistance to Scab Evaluation of Ugandan Cowpea Germplasm for Yield and Resistance to Scab Disease*. June 2017. <https://doi.org/10.9734/AJEA/2016/25138>
- Agza, B., Kasa, B., Zewdu, S., Aklilu, E., & Alemu, F. (2012). *Animal feed potential and adaptability of some cowpea ( Vigna unguiculata ) varieties in North West lowlands of*. May 2014.
- Amayo R., Obuo PJ., Omadi JR., Okwang D., M. E. and J. M. (2013). *Cowpea scab disease*. 1.
- Bationo, A., Ntare, B. R., Tarawali, S. A., & Tabo, R. (2002). Soil fertility management and cowpea production in the semiarid tropics. *Challenges and Opportunities for Enhancing Sustainable Cowpea Production. Proceedings of the World Cowpea Conference III Held at the International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria, 4–8 September 2000.*, 301–318.
- Boukar, O., Belko, N., Chamarthi, S., Togola, A., Batiemo, J., Owusu, E., Haruna, M., Diallo, S., Umar, M. L., Olufajo, O., & Fatokun, C. (2019). Cowpea (*Vigna unguiculata*): Genetics, genomics and breeding. *Plant Breeding*, 138(4), 415–424. <https://doi.org/10.1111/pbr.12589>
- Boukar, O., Fatokun, C. A., Huynh, B., & Roberts, P. A. (2016). *Genomic Tools in Cowpea Breeding Programs : Status and Perspectives*. 7(June), 1–13. <https://doi.org/10.3389/fpls.2016.00757>

- Daryanto, S., Wang, L., & Jacinthe, P. (2015). *Global Synthesis of Drought Effects on Food Legume Production*. June. <https://doi.org/10.1371/journal.pone.0127401>
- Ddamulira, G., Santos, C. A. F., Alanyo, M., & Ramathani, I. (2017). *Maturity , protein content and yield stability of cowpea in Uganda*. 1862. <https://doi.org/10.1080/02571862.2016.1274919>
- Dugje, I. Y., Omoigui, L. O., Ekeleme, F., Kamara, a. Y., & Ajeigbe, H. (2009). Farmers' Guide to Cowpea Production in West Africa, IITA, Ibadan, Nigeria. *Ibadan, Nigeria: IITA, May*, 20. <http://www.icrisat.org/tropicallegumesII/pdfs/Cowpea.pdf>
- Edition, F. (n.d.). *No Title*.
- Gautam, H. R., Bhardwaj, M. L., & Kumar, R. (2013). *Climate change and its impact on plant diseases*. 105(12).
- Gbaye, O. A., & Holloway, G. J. (2011). Varietal effects of cowpea , *Vigna unguiculata* , on tolerance to malathionin *Callosobruchus maculatus* ( Coleoptera : Bruchidae ) Varietal effects of cowpea , *Vigna unguiculata* , on tolerance to malathion in *Callosobruchus maculatus* ( Coleoptera : Bruchida. *Journal of Stored Products Research*, 47(4), 365–371. <https://doi.org/10.1016/j.jspr.2011.06.003>
- Horn, L. N., & Shimelis, H. (2020a). Annals of Agricultural Sciences Production constraints and breeding approaches for cowpea improvement for drought prone agro-ecologies in Sub-Saharan Africa. *Annals of Agricultural Sciences*, 65(1), 83–91. <https://doi.org/10.1016/j.aos.2020.03.002>
- Horn, L. N., & Shimelis, H. (2020b). Production constraints and breeding approaches for cowpea improvement for drought prone agro-ecologies in Sub-Saharan Africa. *Annals of Agricultural Sciences*, 65(1), 83–91. <https://doi.org/10.1016/j.aos.2020.03.002>
- Jorem, A., Charles, A., Robert, A., Geoffrey, L., & Emmanuel, M. (2023). *Evaluation of Improved Cowpea Genotypes for Yield and Resistance to Scab Disease in Uganda*. 1–9. <https://doi.org/10.23880/oajar-16000329>
- Kamara, A. Y., Omoigui, L., Kamai, N., & Ewansiha, S. (2018). *Achieving sustainable cultivation of grain legumes*. January. <https://doi.org/10.19103/AS.2017.0023.30>
- Mbong, G. (2014). Influence of Cropping Pattern Systems on Incidence of Scab and Septoria Leaf Spot Disease of Cowpea (*Vigna unguiculata*). *British Journal of Applied Science & Technology*, 4(17), 2501–2512. <https://doi.org/10.9734/bjast/2014/6229>
- Nair, R. M., Pandey, A. K., War, A. R., Hanumantharao, B., & Smith, P. M. (2019). *Biotic and Abiotic Constraints in Mungbean Production — Progress in Genetic Improvement*. 10(October), 1–24.

<https://doi.org/10.3389/fpls.2019.01340>

- Nakawuka, C. K., & Adipala, E. (1997). Identification of sources and inheritance of resistance to sphaceloma scab in cowpea. *Plant Disease*, 81(12). <https://doi.org/10.1094/PDIS.1997.81.12.1395>
- Fetuga, T. M., Alabi, O., Chindo, P. S. & Alao, S. E. L. (2022). *EFFECTS OF SOWING DATES AND SCAB DISEASE ON YIELD OF COWPEA ( VIGNA UNGUICULATA L . WALP )*. June.
- Ojiewo, C., Maize, I., Rubyogo, J. C., & Wesonga, J. (2018). *Mainstreaming Efficient Legume Seed Systems in Eastern Africa Challenges , opportunities and contributions towards improved livelihoods* (Issue August 2020). <https://doi.org/10.18356/ce824af1-en>
- Ojiewo, C. O., Omoigui, L. O., & Pasupuleti, J. (2020). *Grain legume seed systems for smallholder farmers : Perspectives on Grain legume seed systems for smallholder farmers : Perspectives on successful innovations*. September. <https://doi.org/10.1177/0030727020953868>
- Payne, R., Murray, D., & Baird, D. (n.d.). *Genstat*.
- Mekonnen, W. T., Gerrano, S. A., Mbuma, W. N., & Labuschagne, M. T. (2022). *Breeding of Vegetable Cowpea for Nutrition and Climate Resilience in Sub-Saharan Africa: Progress, Opportunities, and Challenges*.
- Tongoona, P., Shimelis, H., & Sibiyia, J. (2017). *Agronomic Performance and Economics of Yield Loss Associated With Angular Leaf Spot Disease of Common Bean in the Southern Highlands of Tanzania Agronomic Performance and Economics of Yield Loss Associated With Angular Leaf Spot Disease of Common Bean in the Southern Highlands of Tanzania*. April 2019. <https://doi.org/10.1094/PDIS-04-17-0547-RE>
- Yakubu, I., Yusuf, A. A., Kabir, A., Usman, M. S., Bello, S. K., & Praveen Kumar, D. (2019). Efficacy of some bio-control agent formulations on scab of cowpea and groundnut late leaf spot in the Nigerian savanna. *Nigerian Journal of Biotechnology*, 36(1), 34. <https://doi.org/10.4314/njb.v36i1.5>