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Germination and Seedling Performance of Cotton and Sesame under Projected Climate Conditions in Burkina Faso

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Abstract

Cotton (*Gossypium hirsutum*) and sesame (*Sesamum indicum*) are the major export commodities of Burkina Faso. More than 80 % of the population depend on rain-fed agriculture. The projected warming over Africa for the 21st century is higher than the global rate, but most likely to occur over West Africa 1–2 decades earlier between late 2030s to early 2040s. Using climate conditioning chambers we analysed germination rate, emergence time, survival time and seedling performance (root and shoot length, biomass) of 200 cotton and 200 sesame seeds under recent and projected climate conditions. Seeds were obtained at site (Bankandi, 11°08'56.566" N, 003°03'36.446" W). High resolution (12km) regional climate simulations were carried out at Karlsruhe Institute of Technology (KIT/IMK-IFU) as part of the West African Science Service Center on Climate Change and Adapted Land Use (WASCAL) Project. The projected climate conditions were modelled for the year 2040 in Bankandi for the months of June and July (higher temperature and lower relative air humidity above surface (rH in %) during the sowing and early recruitment phase). Recent climate data were collected at site hourly from 2013–2015. Climate chambers were set with a day/night rhythm (12h light/12h dark). Temperatures and rH were set 29,3°C (recent)/ 30,7°C (projected) and 71,4%/ 62,5 % at day time. Night time was set as 26,8°C (recent)/ 29,5°C (projected) and 81,3%/ 72,4 %, respectively.

Germination rate and emergence time did not differ significantly between recent and projected climate conditions in both crop species. However, survival rate and biomass of sesame seedlings were significantly higher under recent conditions. Under projected conditions with higher temperatures and lower rH, sesame roots were significantly more branched than under recent cooler and wetter conditions. No significant differences of germination and seedling performance could be detected in cotton.

Sesame seems to suffer from heat stress and might be more sensitive to climate change than cotton. Varieties of both crop species should be heat and drought resistant to secure future yields and income for the local smallholders.

Keywords: Biomass, Burkina Faso, climate chambers, climate change, cotton, germination, sesame, survival, West Africa

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