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Development of extra-early maturing, Striga and aphid resistance cowpea [*Vigna unguiculata* (L.) Walp] varieties.

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Abstract:

Cowpea (*Vigna unguiculata* (L.) Walp) is one of the most important grain legumes in sub-Saharan Africa (SSA). It is primarily cultivated for its nutritious grain, fresh pods and leaves for human consumption, and biomass for feeding livestock. Usually, cowpea is cultivated during the late season, minor season, and/or under residual soil moisture conditions along river banks. These expose the crop to terminal stresses, such as drought, which leads to low-yield. Development of high-yielding extra-early maturing cowpea varieties with traits preferred by farmers is one of the most important breeding objectives for crop improvement programmes in sub-Saharan African. The objectives of the study were to: (i) determine the allelism of the genes controlling earliness in Sanzi-Nya, Tobonaa, and CB27, (ii) determine the genetic control of the key earliness-related traits (the number of days to 50% flowering and 95% pod maturity) in Sanzi-Nya, Tobonaa, and CB27, (iii) introgress earliness genes into Kirkhouse-Benga and Wang-Kae, using marker assisted backcrossing, and (iv) evaluate Near Isogenic Lines (NILs) developed and the recurrent parents for earliness, grain yield and other agronomic traits. The study was conducted at Nyankpala-Tamale and Manga-Bawku during a three-year period (2019 to 2021). Second filial generation (F₂) populations were developed by crossing the three extra-early maturing genotypes (Sanzi-Nya, Tobonaa, and CB27). These populations were evaluated to study allelism between the genes controlling earliness in the three extra-early maturing genotypes. The six basic generations were also developed by crossing the extra-early and three early to medium maturing varieties (Kirkhouse-Benga, Wang-Kae, and Padi-Tuya). Each population, consisting of P₁, P₂, F₁, F₂, BC₁:1, and BC₁:2 was evaluated to investigate the genetic control of earliness in cowpea. Moreover, the earliness genes from Sanzi-Nya and CB27 were

introgressed into two farmer-preferred Aphid and Striga resistant-varieties, using marker assisted backcrossing. The NILs developed were evaluated at Nyankpala and Manga. The results indicated that, earliness gene(s) in CB27 is non-allelic to those of Tobonaa, and Sanzi-Nya. The study showed that duplicate and complementary epistasis-genes control the inheritance of earliness in cowpea. Among the sixteen NILs evaluated, five (SAC-20KTE-5, SAC-20KTE-3, SAC-20KTE-29, SAC-20KTE-6, and SAC-20KTE-7) reached the number of days to 95% pod maturity (DNPM) in ≤ 60 days after sowing (DAS) compared to the recurrent parents which reached DNPM at ≥ 65 DAS. These promising lines combined high grain yield (≥ 2 t/ha), extra-early maturity, large seed size, Striga and Aphid-resistance. The lines need to be evaluated at multilocations to ascertain their stability and adaptability in different environments and propose them for release as climate smart cultivars. Positive significant association was observed between the key earliness-related traits and grain yield, suggesting that earliness in cowpea does not always come with trade-off for grain yield. Among other benefits, the selected lines would enable farmers reduce the frequency of insecticide applications during flowering and podding stages to control insects.

Publication

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Sanzi seeds (i); field trials with CB27 (ii); advancing materials in 2019 in the greenhouse (iii).