



➔ **5.1.1** Nchimunya Bbebe. (2010). Combining ability of interspecific and mutation-derived lines of cotton (*Gossypium* spp.) for fiber quality and agronomic traits (Supervisors: Dr D. M. Lungu and Dr B. M Siamasonta).

Cotton production in Zambia has been on the increase over the last fifteen years. Most of the cotton grown in Zambia is exported. Zambia's favorable standing on the international market is due to its ability to produce high quality cotton lint. The continued favorable standing of Zambia's cotton depends on continuous improvement in the fiber quality and yield attributes of cotton varieties grown in the country. This is only possible if suitable parental sources of economically important traits are known. A study with the objective of assessing the combining ability of cotton mutants and interspecific lines for agronomic and fiber traits was initiated in 2007/08 season. Five interspecific lines (INTSC-A, INTSC-B, INTSC-C, INTSC-D and INSTC-E) were crossed with five mutants (MFKF-20Kr, MF-20Kr, MCZA-20Kr, MG-15Kr and MCF-30Kr) and three parents of mutants (Chureza, F 135 and G 319-16) in a line by tester mating design during the 2007/08 season at Magoye, Zambia. Forty F_1 progeny and the thirteen parents were evaluated in a Randomized Complete Block Design during 2008/09 season. Collected data included boll count, days to flowering, days to maturity, boll weight, yield per plant, ginning outturn, earliness ratio, fibre length and fibre strength. Line by tester analysis was used to ascertain the breeding value of parental genotypes and the mode of inheritance of agronomic and fiber traits in the population generated. Analysis of variance revealed that there was significant variation in traits such as boll count ($P \leq 0.01$), days to flowering ($P \leq 0.05$), days to maturity ($P \leq 0.05$), boll weight ($P \leq 0.01$), yield per plant ($P \leq 0.01$), ginning outturn ($P \leq 0.01$), earliness ratio ($P \leq 0.01$), and fiber length ($P \leq 0.05$). Line by tester analysis revealed that both additive and non-additive gene action were important in the genetic control of all the traits investigated except yield per plant ($GCA/SCA=1.161$) and earliness ratio ($GCA/SCA=2.74$) in which there was a preponderance of additive gene action. Although both additive and non-additive genetic effects were significant in days to flowering, days to maturity, boll weight, ginning outturn, fibre length and fiber strength, non-additive gene action was more important in the inheritance of these traits ($GCA/SCA < 1.00$). Additive and non-additive gene effects were of equal importance in the inheritance of the boll count trait. Narrow sense heritability estimates were low ($h^2=2.07-19.7\%$)

for the studied traits. In order for selection to be effective for most traits (except yield per plant and earliness ratio) in this population, it must be delayed until later generations of inbreeding such as F_7 and F_8 . Combining ability analysis revealed that a number of lines and testers had positive and significant GCA effects for a number of traits. The mutation derived line MFKF - 20Kr was the best general combiner as it had favorable and significant GCA effects for most traits studied. It should be considered as a parent source of important economic traits in cotton breeding programmes.