



# Analysis of Residual Pesticide Contamination in Zimbabwean Cotton before and after the Ginning Process

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# ABSTRACT

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Advances in the field of textile ecology deal with the impact of toxic chemicals such as pesticide residues on the health and well-being of humans. Local cotton farmers make intensive use of pesticides to control a wide variety of pests, however, the quantities of pesticide residues that remain in the cotton have not been investigated. This study set forth to determine the residue quantities of five most commonly used pesticides that remain in seed cotton, ginned cotton and gin motes, namely endosulfan, fenvalerate,  $\lambda$  cyhalothrin, carbaryl and dimethoate. Seed cotton samples (n=40) were collected from four major cotton production areas in Zimbabwe namely Gokwe North, Gokwe South, Sanyati and Chinhoyi. Ginned cotton (n=20) and gin motes (n=20) samples were collected from two ginneries in Gokwe and Sanyati. Soxhlet extraction was used for isolation of pesticide residues from the cotton samples and further sample clean up was done using solid phase extraction (SPE). Analytical procedures were done using gas chromatography with electron capture detector (GC/ECD) and liquid chromatography tandem mass spectrometry (LC/MS/MS). The results showed that maximum concentration of endosulfan in seed cotton, ginned cotton and gin motes was 3.11ppm, 0.93ppm and 0.33ppm respectively; for fenvalerate 1.57ppm, 0.37ppm and 0.33ppm respectively while for  $\lambda$  cyhalothrin maximum concentration was 3.56ppm, 0.06ppm and 0.09ppm respectively. Carbaryl and dimethoate were below detection limits (<0.006ppm) in seed cotton, ginned cotton and gin motes. The sampling area had no statistically significant effect on concentrations of carbaryl, dimethoate, fenvalerate,  $\lambda$  cyhalothrin and endosulfan ( $p>0.05$ ). Application parameters had a statistically significant effect on pesticide residue concentration ( $p<0.05$ ). No significant ( $p>0.05$ ) differences were found in the pesticide concentrations in ginned cotton and gin motes between Gokwe and Sanyati ginneries. Pesticide concentrations which exceeded the maximum recommended limits of 0.5ppm were linked to the pesticide application practices namely application rate, frequency of spraying, pre-harvest interval and the method of application. As a recommendation further study can be carried out on analysis of pesticide residues in subsequent textile processing such as spinning and weaving/knitting. Residues in cotton seeds and cotton gin trash can also be investigated as these are a source for stockfeed and bioaccumulation of pesticides may occur.