NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF APPLIED SCIENCES

STRIGA GESNERIOIDES IN TOBACCO (*NICOTIANA TABACUM*) ROTATIONS IN ZIMBABWE

CHAPMAN KOGA

A THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR A MASTER OF PHILOSOPHY DEGREE IN APPLIED BIOLOGY AND BIOCHEMISTRY
2013

ABSTRACT

The witchweed (*Striga gesnerioides*), a noxious root parasitic weed of the economically important crops [legumes, cowpea (*Vigna ungucuilata*) and tobacco (*Nicotiana tabacum*)], was identified as the major biotic constraint to tobacco production in Mvuma District's Nyikavanhu area, reducing crop yield significantly. Yield losses due to *Striga* damage were as high as 100% under severe infestation. A diagnostic survey was conducted to assess the severity of the *S. gesnerioides* problem in the Mvuma area. From the tobacco fields assessed, 32% were infested with *S. gesnerioides*, with an estimated area of 16 km^2. About 75% of the *Striga* occurrence was first noticed during the period 2002-7 and the level of damage was reported to be increasing year by year. *S. gesnerioides* detected in tobacco plots, could not be found in other crop fields [maize (*Zea mays*), groundnuts (*Arachis hypogea*), sorghum (*Sorghum bicolor*), cotton (*Gossypium spp*), sunflower and the known host crop, cowpea, an indication of its high host-specificity to tobacco. The *S. gesnerioides* strain/ race affecting tobacco could be different from the one known to affect cowpea. Greenhouse pot experiments and laboratory studies were also carried out to screen for potential trap crops and tobacco resistant genotypes using the root exudates technique. The germination of *S. gesnerioides* seed was stimulated by exudates from the roots of both host and non-host crops [sugars bean (*Phaseolus vulgaris*), ground nuts, round nuts (*Cajanus cajan*) and cowpeas]. Germination stimulation from sugar beans, cowpeas and round nuts was significantly greater than that from other crops; hence they could be used in tobacco rotations as trap crops in an integrated *Striga* control program. Since cowpea can only stimulant *S. gesnerioides* seed germination without further parasitism, it can be an important trap crop in tobacco production. In another study, 12 tobacco genotypes were not significantly different in stimulating *Striga* seeds to germinate ($p>0.05$) and no germination, as expected, was observed in the negative control (water). *Striga* seed germination ranged from 50-67%. A field trial was also conducted to evaluate the effect of varying basal (NPK 6:15:12) and nitrogen (34.5% N) fertilizer levels on *Striga* infestation, and also testing for tolerant tobacco genotypes. High rate of nitrogen fertilization (50 kg N / ha) was found to cause a reduction in numbers of emerged and maturing *Striga* plants and hence a reduction in the *Striga* seed produced. This was consistent in all the 3 seasons (2007-2010), in which high N treatments were significantly suppressing *Striga* parasitism. The severity of *Striga* attachment was also believed to be dependent on the amount of germination stimulants produced by each of the varieties. The two landraces (LR11 and LR12) were severely infested, with yield significantly lower ($p<0.05$) than that of other commercial cultivars (T66, T61, KRK26). T66 was found to be the most tolerant cultivar. The use of high rates of nitrogen fertilisers (50 kg N/ ha) and the most tolerant cultivar (T66) could assist in reducing tobacco yield losses, and rotating tobacco with sugar beans and round nuts as trap crops can reduce *Striga* seed bank by inducing suicidal germination of *Striga* seeds. However, additional studies on field evaluation of the potential trap crops and elucidation of resistance mechanisms of tobacco to *S. gesnerioides* are recommended for future studies.