

Faunal association and properties against storage pests of *Withania somnifera* Dunal to promote cultivation as a potential medicinal crop in Sri Lanka

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Abstract

The medicinal plant, *Withania somnifera* (Ashwagandha) is becoming popular among farmers. Due to its importance, farmers are interested to cultivate it in larger extent. This study was aimed to assess the potential of *W. somnifera* to cultivate in Jaffna, identify the associated fauna and investigate the effect of its extracts against storage pests. Different field trials and *in vitro* studies were conducted. For field trials, Seeds of *W. somnifera* were water soaked overnight and sown to evaluate the phenology of the plant. Results showed that germination was observed 5.6 ± 1.16 days after sowing in nursery. One month old seedlings were transplanted at 45cm×60cm spacing. Phenology of *W. somnifera* revealed that it was flowering continuously. Flowering and fruiting were commenced 66.17 ± 3.43 and 79.77 ± 2.07 days after the transplanting, respectively. Roots reached economic timber value between 6-7 months old because at that time root:shoot ratio was optimum (0.54 ± 0.09 to 0.65 ± 0.13). Average seed production rate was 6581.89 seeds/plant. To break down seed dormancy, seeds underwent to hot water soaking at 80°C for two hours and water soaking for overnight. Results registered, germination percentages were $52.75 \pm 3.50\%$ and $33.75 \pm 2.75\%$, respectively compare with control ($12.5 \pm 2.08\%$). The arthropod fauna and diseases associated with *W. somnifera* were recorded. Among 39 arthropod fauna, 12 and nine species were defoliators and sucking insects, respectively and the rest of them were beneficial insects. Moreover, root-knot nematode and little leaf disease were recorded as disease. In the *in vitro* studies, Larvae of *S. cerealella* were introduced to healthy fruits of *W. somnifera* to evaluate its damaging capability. The results revealed that larvae damaged the fruits and due to this seeds lost their germinating ability completely. In another study, the shoot extract of *W. somnifera* at the level of 20, 40, 60, 80 and 100% were studied for their insecticidal activity on *S. oryzae*. Mortality was assessed after 5 and 10 days after treatment (DAT). Mortality at maximum concentration (100%) were 84.17% and 86.07% both in 5 days and 10 days, respectively but not significantly on par ($P < 0.05\%$). Furthermore, leaf, fruit, root and shoot extracts of *W. somnifera* at the above mentioned levels were evaluated against storage pests, *S. oryzae*, *C. chinensis* and *T. castaneum*. Damage percentage of *S. oryzae* and *C. chinensis* were taken at 7 DAT and Grain weight loss (GWL) by *T. castaneum* was taken at 7, 30 and 60 DAT. Minimum GWL by *T. castaneum* as observed in 30 and 60 days after treatment (DAT), of 0.7 ± 0.12 and $3.17 \pm 0.47\%$ respectively. GWL was increased with time. Damage percentage of green gram by *C. chinensis* exhibited an indirect relationship with the concentration. Among different extracts, the sets treated with 100% of extracts recorded lowest damage ($3.36 \pm 1.31\%$) followed by 80% ($5.6 \pm 0.98\%$) of concentrations. Lower damage by *S. oryzae* was observed leaf extract

($2.40 \pm 0.68\%$) followed by fruit ($2.47 \pm 0.09\%$) and root ($2.93 \pm 0.76\%$) extracts but root extracts reduced the damage percentage from lowest concentration. These studies suggest that the climate and soil prevalent in Jaffna are suitable to multiply this herb with least cost and extracts can be used to protect the grains from storage pests under small scale.