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Aloe barbadensis Provides Antiviral Defense to Tasar Silkworm

Idress Hamad Attitalla
Department of Botany, Faculty of Science, Omar El-Mukhtar University, Box 919, El-Bayda, Libya

Antheraea mylitta is also known as tasar silkworm, it is reared for its silk of various colors and patterns and these traits are influenced by many environmental factors (Vijayan *et al*., 2010). Its rearing is easy because it can feed on variety of plants e.g., *Terminalia arjuna, T. tomentosa, Shorea robusta, Lagerstroemia indica* etc. Another benefit of tasar silkworm is its fibroin protein, which is less soluble in water and organic solvents than mulberry silkworm produced fibroin (Acharya *et al*., 2009). This different protein provides a nontoxic and better support to fibroblast (used in wound healing) culture media. Moreover tasar silkworm produced sericin protein acts as an antioxidant and protects the skin form Ultraviolet B (UVB) radiations (Dash *et al*., 2008). It saves the human skin keratinocytes by inhibiting the UVB caused hydrogen peroxide production and in this way it may also protects the mitochondria from this damage. But the population of economically beneficial silkworms are highly endangered by the attack of different pathogens e.g., bacteria, fungi and virus (Babu *et al*., 2009). The viral infection cause a significant loss of crop by putting a bad affect on silkworm epidermis, tracheal matrix, silk gland, hemolymph etc. The virus which causes infection in tasar silkworm is *Antheraea mylitta* Cytoplasmic Polyhedrosis Virus (AmCPV), it cause mortality and its infection rate is determined by worm's hemocyte counts (Singh *et al*., 2008). It can be treated through antivirus vaccine (attenuated AmCPV) but vaccine provides short term immunity to silkworm, hence is yet under development (Singh *et al*., 2011). Thus there is need of more efficient antiviral control, which may have its origin in plants (Sohail *et al*., 2011), as Manimegalai *et al*. (2000) found plants derived powder effective against grasserie causing polyhedral virus. These plants provided more than 60% protection to mulberry silkworm from virus infection. So if any plant derived viral control against AmCPV is obtained this may protect tasar silkworm.

The developmental rate of tasar silkworm depends upon the type of food given to it, as it has high survival rate on semi-mature leaves of *T. arjuna* (Rai *et al*., 2006). Although young leaves have more nutrition, semi-mature leaves contain relatively lower proteases levels (anti-herbivore), which can be easily endured by silkworm. Thus silkworm is highly dependent upon the type of food and any modification in its diet may enhance its survival. To estimate the effect of plant diet on AmCPV infection Kumar *et al*. (2012) conducted a research on tasar silkworm. After infecting larvae with virus, they fed them on *T. arjuna* leaves treated with extracts of 13 different plants. Thus the plant application on larvae was a post treatment and their aqueous extracts of different concentrations were prepared from the plants' bulb, leaf or rhizome. The virus infection killed 91.66% silkworm of first crop and 89.33% of second crop, thus it putted significant population in danger. All applied plant extracts were effective in lowering this mortality rate but the most significant results were of plants *Aloe barbadensis*, *Psoralea corylifolia* and *Bougainvillea spectabilis*. Among these the 2% *A. barbadensis* was highly active in reducing mortality; it reduced mortality up to 32.25% in first crop and 28.04% in second crop. In this way it protected almost 66.17% (mean value) of silkworm population. Silkworm larvae treated with these three plants (*A. barbadensis, P. corylifolia* and *B. spectabilis*) were subjected to further studies of some crop and blood tests. Among crop parameter maximum positive effects were the products of *A. barbadensis* 2% aqueous extracts. As due to its application 51% cocoons were harvested with 31.57% cocoon weight, 1.54% shells weight and 11.25% silk ratio. Other extract of plants were also able to positively affect these parameters, but their results were lower than *A. barbadensis*. Furthermore, during the study of blood parameters (hemocyte count and total protein contents) maximum effective concentration of these extracts were derived from *A. barbadensis*. The virus infection caused an increase in hemocyte count up to 3 days, after which it started to decrease and at day 8 it was 3812. This decline in hemocytes showed the decrease in silkworm immunity, which decreased as time passed after virus infection. But the application of *A. barbadensis* extract reduced this decline in hemocyte and protected the silkworm from virus. Its application caused an increase in hemocyte count up to day 6, which slightly decreased at day 7 but again increased at 8th day. This decrease in hemocyte at day 7 was not worrisome as normal uninfected larvae also showed the same pattern of hemocyte level. Moreover the *A. barbadensis* extract was effective in maintaining the protein level as well, which was severely decreased by virus infection. Thus virus mode of infection included the reduction in silkworm's

protein and the application of plant extract save them from this loss. As in virus inoculated worms protein contents were only increased from 16.26 (day 1) to 20.25 mg mL^{-1} (day 8). Whereas in *A. barbadensis* treated worms the protein contents were increased from 16.17-35.27 mg mL^{-1}. Thus *A. barbadensis* application in worm's diet benefited it by decreasing mortality and increasing survival, which was probably due to increase in hemocyte and proteins. Moreover its application assisted in good crop production by increasing worm's weight and silk ratio.

Antheraea mylitta (tasar silkworm) is an important silkworm due to its fascinating silk and healthy proteins. But its production can be arrested by the infection of AmCPV, which cause a high mortality rate. In a recent research conducted by Kumar *et al.* (2012), it was observed that AmCPV caused losses to tasar silkworm can be manipulated by the use of *A. barbadensis* extracts. As its inclusion in larvae food increased larva weight, silk, protein contents and hemocyte count. Thus more research on *A. barbadensis* application as an ingredient of tasar silkworm food will help in reducing crop loss caused by AmPCV.

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