SYNERGISTIC EFFECT OF TWO COMBINATIONS OF SENNA PLANT ON THE TEGUMENT OF A RAT TAPEWORM HYMENOLEPSIS DIMINUTA

SUMAN KUNDU*, SAPTARSHI ROY*, LARISHA M. LYNDEM**
*Parasitology Research Laboratory, Department of Zoology, Visva-Bharati University, Santiniketan 731235, West Bengal, India
Email: lyndemlarisha@gmail.com

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ABSTRACT

Objective: Traditional systems of medicine have been adopted in different health care systems worldwide. Amongst them, plant and plant parts have been the most potential based. Our present study was conducted on the treatment of tapeworm Hymenolepis diminuta with two combinations of three Senna plant, S. alata (Sal), S. alexandrina (Sax) and S. occidentalis (Soc).

Methods: Alcoholic extracts were prepared for individual plant and extracts obtained were mixed in a ratio of 1:1 as Sal+Sax, Sal+Soc and Sax+Soc in phosphate buffer saline (PBS) and 1% Dimethyl sulfoxide (DMSO) at pH 7.4 to find out if any synergistic anthelmintic effect occur, since individual plant have already shown vermifugal effect on the parasite in our earlier studies.

Results: Dose-dependent efficacy was observed in all concentrations and in all combinations. Scanning electron micrographs (SEM) showed distortion in the scolex region with shrinkage all over the body tegument; infoldings were observed in proglottids compared to control. Time of paralysis was comparatively less than individual treatment.

Conclusion: Our observation suggests that a combination of two plants is having a synergistic anthelmintic effect on the tapeworm, which could be exploited further in combination drug therapy. Further studies are required to isolate the phytochemical constituents of each Senna plant.

Keywords: Hymenolepis diminuta, Synergistic, Tegument, Shrinkage.

Natural products play a dominant role in the development of novel drug leads for the treatment and prevention of diseases. With the worldwide interest in adopting and studying traditional systems and exploiting their potential based on different health care systems, there is increasing focus on global searches for new drugs derived from natural plant resources. The genus Senna (Family: Leguminosae) comprises of 580 species of herbs, shrubs and trees, which are widely distributed throughout the world, of which only twenty species are indigenous to India [1]. Many of the Senna spp. possesses a good amount of medicinal properties. Some of which like Senna alata (Sal), S. alexandrina Vahl (Sax) and S. occidentalis Linn (Soc) have been reported in our earlier studies to have anthelmintic effect on flatworms [2-4]. A decolorization of the leaves of Sax and Sal was widely practiced in India [5] as compared to other plants. Such type of combination chemotherapy was also common in medical practices in several medical fields such as cancer, bacterial infections, HIV or malaria [6-8] as well as in veterinary medicine [9].

Recent studies made by Klongsiriwet et al. (2015) [10] showed a synergistic effect of two plant compounds in inhibition of escheatment of Haemopinus contortus (cattle round worm). Thus, it is interesting to explore if the combination of crude extracts of Sal+Sax, Sal+Soc and Sax+Soc are having any synergistic anthelmintic effect on a zoonotic tapeworm Hymenolepis diminuta.

Fresh leaves of the three Senna plant were oven dried and crushed to powder. The latter were mixed with ethanol and extracted in Soxhlet apparatus, and the final crude extracts of each leaf were recovered through rotary evaporator. The parasite H. diminuta was maintained in our animal laboratory as described in our previous communication [3]. After infection, rats were anesthetized with isoflurane and autopsied. Recovered live worms from intestine were exposed to 10, 20 and 40 mg/ml concentration (same set of experimental concentrations there is variation in the time to cause death of the parasites to die). This may be suggested that combination of plant extracts possesses vermifugal activity in nature and may exert a reversible action on the neuromuscular system of the worms and the inactiveness caused would lead the parasite to be swept out of the host's body [12]. Dose-dependent efficacy was also observed with exposure to various concentrations of each combination, as an increase in concentration, shortens the paralysis period. Similar observations were recorded in our earlier studies when H. diminuta was treated with single leaf extracts of Sal and Soc respectively [2, 4] as well as reported in many other ethnomedicinal plants [13,14]. SEM studies revealed irreversible damage in the tegumental contour of the whole body, shrinkage and distortions in the scolex and suckers as well as infoldings in the proglottids were observed in our study (fig. 2B,C and D) compared to control (fig. 2A).

This may be due to hyperpolarization in the muscle membrane of treated worms and reducing excitability that could lead to muscle relaxation and Baccid paralysis. These changes were also seen when treated with single species of Senna [2, 4]. Our present study also revealed vacuolization on the treated worm's surface (fig. 2F,G and H) compared to control (fig. 2E). Such changes are common features observed in other helminths treated with anthelmintic plants [15, 16]. This may be regarded as a stress response resulting from emergency repair to a damaged tegument induced by many harmful elements [17]. However this combination treatment showed more activity.
CONCLUSION

Thus, these plants besides having vermifugal/vermicidal activity also showed a synergistic effect when treated in combination. However to understand the therapeutic components of activity, isolation of active compounds needs to be investigated.

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CONFLICT OF INTERESTS

Declared none.

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