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Research Article

EVALUATION OF ANTI-OXYTOCIC ACTIVITY OF *ASPARAGUS RACEMOSUS*

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ABSTRACT

Objective: The objective of the study was to evaluate the anti-oxytocic activity of ethanolic extract of *Asparagus racemosus* root.

Methods: Ethanolic extract of *A. racemosus* root was taken by Soxhlet extraction method. Wistar strain albino non-pregnant female rats of weight 200–300 g were pre-treated with estrogen and were sacrificed to take their uterus. The tissue was then mounted in an organ bath containing de Jalon's solution. The response of the tissue to various doses of oxytocin alone and then on adding increasing doses of the alcoholic extracts of *A. racemosus* along with the dose of oxytocin which produces sub-maximal contraction were recorded on a smoked drum.

Results: Extract in doses up to 40 mg when given along with oxytocin 0.1 unit produced graded increase in contractions in rat uterus. From 80 mg onward graded blockade of contractions occurred with complete blockade at 200 mg. On complete removal of the extract by thorough washing, it was seen that oxytocin was again able to produce contractions of the rat uterus tissue.

Conclusion: The ethanolic extract of *A. racemosus* root had demonstrated good anti-oxytocic property.

Keywords: *Asparagus racemosus* root, Soxhlet extraction, Anti-oxytocic property, Partial agonist.

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INTRODUCTION

Traditional medicine which uses plants as a source of drugs is gaining more importance nowadays. Most of the drugs derived from modern medicine are also obtained from plants [1]. They also are used by majority of rural people especially those who are marginalized, living in developing countries in the world [2]. In developed world also herbal medicines are nowadays widely used as nutraceuticals and food supplements for various ailments [3]. Such preparations were vigorously marketed in the times of corona pandemic throughout the world. This highlights the importance of conducting research of traditional medicinal plants. *Asparagus racemosus* commonly called Shatavari is a climber plant widely grown all over India and its root are fleshy and tuberous. In herbal medicine, *A. racemosus* root is being used for the treatment of various ailments such as urinary tract infections, diarrhea, and dysentery because of its anti-microbial activity [4-6]. It is having good antibacterial activity against Gram-negative bacteria [7]. It is used even in modern medicine also as a galactogogue which increases breast milk production [8]. Medicinal properties of Shatavari had been described in Indian and British pharmacopeias. Shatavari also been mentioned having anti-oxytocic property *in vivo* [9]. However, oxytocin is a hormone which facilitates milk ejection from mammary gland during lactation and acts as a galactogogue [10]. Shatavari is also widely used as a galactogogue. Hence, theoretically anti-oxytocic and galactogogue are two opposite actions. There are hardly any studies on the effect of Shatavari on uterus in published literatures. Hence, in this context, it was decided to test whether Shatavari is having any anti-oxytocic activity on rat uterus.

METHODS

Approval of the study

The experimental protocols were approved by the Institutional Animal Ethics Committee (IAEC), Government Medical College, Thiruvananthapuram, Kerala, India (No:30/IAEC/MCT06)

Collection of the plant material

Fresh roots of *A. racemosus* were collected locally from an organic farm and were authenticated by the Department of Pharmacognosy, Regional Research Institute Drug Research (Ayurveda), Poojappura, Thiruvananthapuram, Kerala, India.

Preparation of the plant extracts

The fresh roots of *A. racemosus* were washed thoroughly in water to remove the soil material. It was then cut into small pieces and shade dried at a temperature of 28–33°C for 2 weeks. They were then powered thoroughly by an electric grinder. The powder thus obtained was sieved out to get good quality fine powder. Soxhlet extraction was then carried out using 90% ethanol. The extract thus obtained was distilled and then dried in a autoclaved beaker at a temperature of 50°C using a flash evaporator.

Experimental animals

Wistar strain albino rats of female sex which was non-pregnant and weighing 200–300 g were used for the study. The animals were obtained from the animal house of Government Medical College, Thiruvananthapuram, Kerala, which is approved by the Committee for the Purpose of Control and Supervision of Experiments on Animals, Government of India. The animals were acclimatized to laboratory conditions for 1 week before the test. The animals were fed with standard pellet, maintained on natural light and dark cycle, and had free access to water.

Experimental design

The rats were pre-treated with diethyl stilbestrol 0.1 mg/kg subcutaneously 36–48 h before the study. They were then sacrificed by stunning. The abdomen was then opened and the uterus identified. One horn of uterus was dissected out carefully and was suspended in an organ bath containing de Jalon's solution. The tissue was allowed to relax for 30 min. Varying concentrations of a known solution of oxytocin such as 0.001 IU, 0.005 IU, 0.01 IU, 0.03 IU, 0.1 IU, 0.3 IU,

and 1.0 IU were added to the bath. When 1.0 IU added, sub-maximum response was produced (Fig. 1). The contractions were recorded on a uniformly smoked drum for 30 s and the tissue was allowed to relax for 2.5 min. Soon after recording each contraction, the tissue was washed thoroughly to remove all the drugs from it. Then, the response produced by 0.1 IU was selected from the graph. The same dose was again added to the bath and the response was recorded twice. Then, increasing doses of the extract that is 10 mg, 20 mg, 40 mg, 100 mg, and 200 mg were given along with the selected known dose of oxytocin and its effect was noted on the contractions (Fig. 2).

RESULTS

The extract when given alone produced contractions in the isolated rat uterus at low doses. There occurred an increase in the amplitude of uterine contractions when dose up to 40 mg of the extract was given along with oxytocin. The extract started blocking the contractions produced by the selected fixed dose of oxytocin (0.1 IU) on the uterus from 80 mg onward and with the dose of 200 mg of the extract complete blockade of oxytocin-induced contraction occurred. On complete removal of the extract by thorough washing of the tissue, it was seen that oxytocin is again able to produce graded uterine contractions (Fig. 3).

DISCUSSION

Increase in the amplitude of uterine contraction with low doses of the extract of *A. racemosus* along with oxytocin shows that in low doses it may be having agonistic action potentiating the effect produced by oxytocin. However, as the dose increases above 80 mg, there occurs graded decrease in amplitude of contractions antagonising the effect of oxytocin. Hence, we can presume that the ethanolic extract of *A. racemosus* is having a partial agonistic action in uterus. A partial agonist is a drug that binds to the receptor but produces an effect less than that of a full agonist. The presence of a partial agonist will alter the response of a tissue to a higher efficacy agonist. A partial agonist will induce some level of response depending upon the concentration applied, but it also blocks the effect of a full agonist by competitively

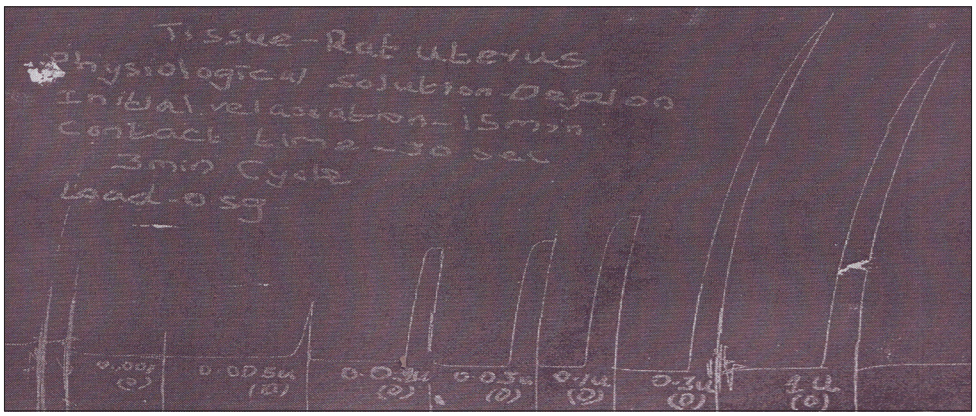

Fig. 1: Effect produced by various doses of oxytocin

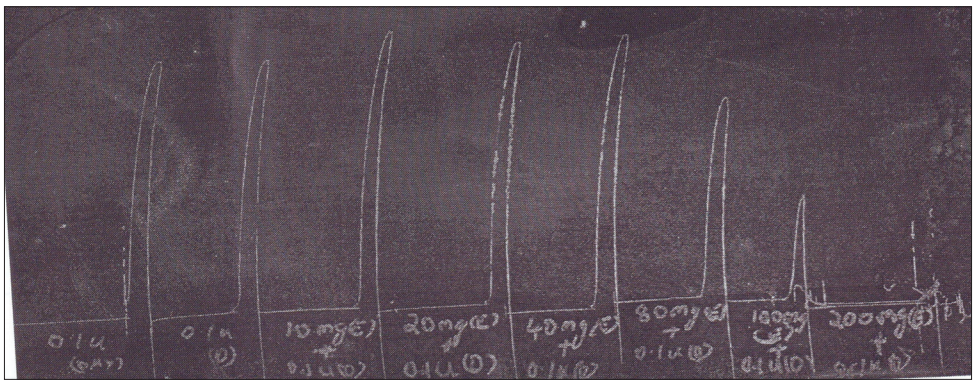

Fig. 2: Effect produced by oxytocin with increasing doses of the extract

Fig. 3: Effect produced by oxytocin after washing off the extract from the tissue

occupying all the receptors. A full agonist will produce maximum response but a partial agonist will produce only sub-maximal response and they sometimes produce barely detectable responses even though they occupy all the receptors [11]. Here ethanolic extract of *A. racemosus* in high doses acts as a partial agonist antagonizing the action of pure agonist oxytocin. Oxytocin is a hormone synthesized in the supraoptic and paraventricular nuclei of hypothalamus along with anti-diuretic hormone and is stored in posterior pituitary. Receptors of oxytocin are present in breast, uterus, as well as in brain. In breast suckling causes release of oxytocin along with another important hormone prolactin which helps in ejection of milk [12]. Oxytocin also has a role in maintaining calm, love, and healing [13]. Oxytocin is widely used for induction of labor and also in the treatment of post-partum hemorrhage. In uterus, oxytocin induces uterine contractions. The level of oxytocin increases from first to third trimester of pregnancy with maximum level at the day of delivery [14]. Inhibition of this action by tocolytics which produces uterine relaxation is used in the management of preterm labor [15].

CONCLUSION

This study on rat uterus with ethanolic extract of *A. racemosus* showed that in high doses it is a promising drug that can be utilized clinically due to its antioxytocic action in prevention of preterm labor and threatened abortion. Lot of toxicity studies done on asparagus racemosus showed that it is safe in high doses also. At the same time, in low doses it is having synergistic action which will be counterproductive if we use it for preterm labor or threatened abortion. Instead low doses have a promising effect in induction of labor and involution of uterus during post partum period. Studies with aqueous extract also need to be conducted to know whether the same action is produced. Furthermore, whether the partial agonistic activity in high doses is present in other tissues especially breast needs to be investigated further.

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AUTHORS' CONTRIBUTIONS

All authors have contributed equally for this research study.

CONFLICTS OF INTEREST

There were no conflicts of interest or financial support among the authors.

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