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Successful chemical restraining and management of an Asian elephant (*Elephas maximus*) during musth

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Abstract
This paper presents a successful chemical restraining and management of a bull Asian elephant (*Elephas maximus*) during musth. The elephant was anaesthetized with a combination of Xylazine and Ketamine hydrochloride @ 400 and 300 mg respectively. The elephant was anaesthetized after 20 minutes of the drugs injection. Both the limbs of the elephant were tied with special chains to restrict his movement. The elephant was kept on constant watch and restricted his movement until musth period is over. We suggest awareness to *mahouts* and owners about physiological behavior of elephant to detect early signs of musth for its better management.

Keywords: Asian elephant, musth, Xylazine, Ketamine, anaesthesia, management

1. Introduction
The Asian elephant (*Elephas maximus*) is the only living species of the genus *Elephas* and distributed in Southeast Asia from India and Nepal in the west to Borneo in the east. Musth is noticed in a normal physiological condition in bull Asian elephant, which is characterized by aggressiveness and heighten sexual activities due to rise in reproductive hormones especially testosterone [1]. Musth has been noticed in adult bull Asian elephant between 15 to 60 years of age. It is occurring in once in a year and in certain cases twice in a year and it may remain for 2 to 3 moths [2]. Musth is usually normal in wild condition but it becomes a problem only in the case of man-elephant interactions [3]. During this period, the elephants become too dangerous as they become a threat to human beings. This is a situation which at times, warrants Veterinary intervention [4]. This paper presents a successful chemical restraining of a violent bull Asian elephant during musth and its management.

2. Materials and Methods
A twenty nine (29) years old bull Asian elephant or *Makhna* (tuskless male) was reported to have suddenly turned violent and uncontrollable in Sootea, Biswanath district of Assam. The elephant had killed his *mahout* two days before by crouching on the ground with his limbs after pushing down with his trunk. The owner disclosed that the elephant had a discharge from temporal gland, prolonged period of penile erection and behavioral alteration since a week but they took it lightly and no preventive measures were taken. The elephant also charged to all, whoever tried to go near by him.
The owner approached the local Forest Department for Veterinary intervention as the elephant was uncontrollable and becomes a threat to human beings. Considering all the facts, it was declared as musth elephant and decided to restrain the elephant chemically to tie him with chains for restricting his movement until the musth period is over.
The bull elephant was about 4000 kg body weight. A combination of Xylazine hydrochloride @ 400 mg and Ketamine hydrochloride @ 300 mg was utilized to produce standing anaesthesia in the elephant. The total volume of 7 ml of drug (4 ml of Xylazine hydrochloride, 100mg/ml and 3 ml of Ketamine hydrochloride, 100 mg/ml) was loaded in a metal dart and projected through Dist-inject N 60 rifle. The drug was injected to deep intra muscular at rump region. The elephant was left undisturbed and observed for signs of standing anaesthesia from a distance.

Fig 1: Asian elephant in musth. Elephant in standing anaesthesia with tied limbs and showing enlarged temporal gland behind the eye.

3. Results and Discussion

The desired level of anaesthesia was induced after 20 minutes of drugs injection. The elephant showed the signs of standing anaesthesia manifested by diminished tail, trunk and ear movements, relaxation of penis with dribbling of urine (Fig. 1), which was in agreement with the reports of the researchers in Asian elephants [1, 5]. Once the elephant became calm, he had been approached from back and both the hind and fore limbs were tied with special chains to restrict his movements. The action of anaesthesia was lasted for 3 hours, which was in collaboration with the reports of others in Asian elephant following Xylazine and Ketamine anaesthesia [6]. The elephant was watched constantly until he came to its normal state and it was observed by urination and movement of tail, ears and trunk. The owner was instructed to keep constant watch on the elephant and not to move him until the musth period is over.

Musth is a normal physiological phenomenon in male Asian elephants. The signs of musth are recorded as alertness, spread ears, staring eyes, stiff or tense body, extended blowing trunk, enlarged temporal glands (Fig. 1) with temporal gland discharge and charging or destructive tendency towards human beings, especially *mahouts*, which was in agreement with the reports of others in bull Asian elephants [7]. Ananth [8] also has been reported the enlargement of temporal glands and a brown coloured foul smelling paste like secretion escapes from the opening of semi-enlarged temporal glands when massaged in Asian elephants during musth. It is revealed that the mean normal serum testosterone concentration in captive Asian male elephants vary from 1-10 ng/ml; while in pre-musth and musth, the levels reach up to 10-20 ng/ml and 20-50 ng/ml, respectively which appears to be responsible for aggressive and violent behavior of the animals during musth [9].

As it is a normal physiological process, there is no any particular treatment. In the present case, chemical restraining of the violent animal is adopted to tie the limbs for restricting his movements until musth period is faded. The most commonly used drugs for chemical restraining is the combination of Xylazine and Ketamine hydrochloride @ 0.1 and 0.08 mg/kg b. wt. respectively in Asian elephants [6]. It has been stipulated that combination of Xylazine and Ketamine hydrochloride minimizes the undesirable effects and produces balanced sedation supporting the retention of vital functions in Indian elephants [10].

4. Conclusion

Musth is an emergency condition in the case of man-elephant interactions. Chemical restraining and securing is the only option when the animal becomes a threat to human beings. We suggest awareness to *mahouts* and owners of elephants about the physiological behavior of elephant to detect early signs of musth for its better management.

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