S. emarginatus and A. serratus display characteristic flowering phenology with alternation of staminate and pistillate functions within individual plants contributing to temporal dioecism.

C. canescens and C. halicacabum do not exhibit such flowering phenology. The simultaneous presence of staminate and pistillate flowers in C. canescens at the plant level facilitates selfing through geitonogamy and the synchronous flowering of plants in an area allows fruit set through xenogamy. Selfing may be a special adaptive value for this herbaceous vine, and compatibility to cross-pollen provides scope for maintaining genetic heterogeneity. The production of more staminate flowers against pistillate flowers is a mechanism for adjusting genetic heterogeneity. The production of pollen provides scope for maintaining genetic heterogeneity. The production of pollen provides scope for maintaining genetic heterogeneity.

Since last two years one of us (M.K.K.) has been observing dogs for their grass-eating habit. About 25 dogs were observed during this period which included Dober-
man, German Shepherd, Rottweiler, Labrador, Spitz, Pomeranian and some local breeds. These pets eat grass usually when they have, indigestion, liver dysfunction, poisoning or any other gastrointestinal problem to induce (3–5 min in the dogs observed) vomiting. Often self-treatment was found to be an effective naturopathy, but in severe cases of liver dysfunction and poisoning (with insecticides, pesticides or any other poison of same category), it was not much rewarding. In such cases this treatment only delayed the deterrent effects and for survival the pets also required medical aid. In one case (poisoned with malathion), in spite of self-treatment and delayed medication the dog died due to toxic effects.

Critical observations of pet habit and vomiting (mixture of bile and grass) the grass observed was found to be *Cynodon dactylon* (L.) Pers. (Figure 1 a). Further, the grass parts in the vomitus (the vomiting extract from the stomach) are usually found intact or minutely ruptured, showing that the animals often try to swallow, but never chew it. *C. dactylon*, locally known as dhub or doob, is also a good Ayurvedic medicine. Leaves and culms in some regions have served as famine food and the rhizome is considered to have laxative property. One of the important grass in medical preparation is also used as a substitute for *E. hispidus* (dog grass) in Indian *Materia Medica*.

There could be two main factors by which doob induces vomiting in dogs. First, is the scabrid margin of leaf blades with minute bristles (Figure 2). When dogs swallow this grass, the bristles on the margin of the leaf blades, or the leaf blade pieces irritate the inner layer, i.e. mucus membrane and muscles of the oesophagus, pharynx, larynx and stomach, which further causes regurgitation and brings out the vomitus. This process of regurgitation in dogs due to grass leaves can be explained by the fact that whenever there is a tendency to vomit human beings often try to irritate the oesophageal area by putting two fingers inside the mouth to induce vomiting. Similarly, as mentioned earlier, dogs ingest/eat the leaves of *C. dactylon* to create irritation. Second, dogs (carnivorous) are usually fed on flesh and cooked vegetables. When they swallow raw grass, the internal layers of the digestive tract do not accept it, and comes out as vomitus along with all other materials through regurgitation. The second explanation seems inappropriate and raises a question: when regurgitation can also be done with other grasses or herbs, then why do dogs prefer *C. dactylon*. It might be possible that some unknown chemical(s) extracted from the leaves, on reaching the gut, react with the materials present there and bring out the vomitus.

But as previously mentioned the leaf blades are often found intact (not crushed) and there are less chances of chemical release, and thus any reaction. However, this needs further study. Also, *C. dactylon* is an odourless grass, whereas most plants with bristles or hairs often release/have some kind of chemical aroma, due to which they may be ignored by dogs.

During winter when offshoots of this grass and other cereals are mature, fungi like *Ustilago* sp. (Smut, Figures 1 b and 3 a–c) and *Claviceps* sp. (Ergot) parasite the inflorescence. The intake of infested grass in smaller amounts for a longer period results in diarrhoea, colic, vomiting and abdominal pain in cattle. But when these cattle take infested grass in large amounts it causes gangrene, poisoning and abortion in pregnant animals, which sometimes results in death. Extensive outbreak by the fungi has been reported to occur in different parts of USA, Germany, Austria, Australia and Europe. In India also, such effects have been observed in cattle. It is important to note that dogs never eat the infested *C. dactylon*, as they possess the ability to recognize the infection. How dogs do so is still unknown. Also, how pet dogs that have been grown in isolation, hunt for this grass only during illness is not known. It seems likely that there could be a chemical compound (having mild odour) in the leaves or culms, that is absent in other herbs or grasses, and is peculiarly recognized by the dogs that stimulates them to identify the grass.

It has also been noticed that rarely some dogs eat (not swallow) other grasses like *Zoysia pacifica*, *Digitaria sp.*, *Leprochloa panicea*, etc., when they are not ill, but for the reasons unknown.

*C. dactylon* is considered a sacred grass by the Hindus with its earlier descriptions found in *Artharva Veda* as ‘May Duba’ and in *Rig Veda* as ‘Durva’. Its vernacular names, important chemical constituents and medicinal properties in brief are provided below for further references.


Vernacular name – English: Cough grass, Dog grass; Hindi: Doob, Hariyali, Ramghas; Oriya: Duba; Punjabi: Khabbal, Talla, Duba; Sanskrit: Dhurva, Haritali;
Chemical constituents – Six phenolic phytotoxins, ferulic, syringic, vanillic, p-coumaric, acetic acids, are reported from the plant. Leaves contain tricin, flavones, C-glycosides and a flavonoid sulphate. It is a good diuretic and used in case of dropsy and anasarca. Infusion of roots is useful to stop bleeding from piles. It is a good plant antiepileptic, anti-diarrhoeal, anti-catarhal and inopthalmia. The excreted juice is astringent and can be applied to bleeding cuts and wounds.

Medicinal properties – The rhizome of this grass is used in urinary problems. It is a diuretic and used in case of dropsy and anasarca, and also used in secondary Syphilis. Infusion of roots is useful to stop bleeding from piles. It is a good plant antiepileptic, anti-diarrhoeal, anti-catarhal and inopthalmia. The excreted juice is astringent and can be applied to bleeding cuts and wounds.


ACKNOWLEDGEMENTS. We thank the Director, Botanical Survey of India (NRC), Dehra Dun for providing facilities. We also thank the Director and Chief Librarian, Indian Council of Forestry Research and Education, Dehra Dun and Wildlife Institute of India (WII), Dehra Dun for providing library facilities. Dr Vandana, DAV (PG) College, Dehra Dun and Manoj Hembarum, BSI (NRC) helped identify the fungal infection. We are grateful to Dr G. S. Rawat, WII, and Dr Prashant Pusalkar and Manas Ranjan Dehta, BSI (NRC) for useful suggestions.

Received 22 March 2010; revised accepted 15 July 2011.