CONFUSION BETWEEN *Chrysopogon nemoralis* AND *Chrysopogon zizanioides* AT BO BO MOUNTAIN IN QUANG NAM PROVINCE, VIETNAM

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Abstract

Vetiver grass (*Chrysopogon zizanioides* L.*)* is well known for its numerous unique characteristics and environmental friendliness. Currently, vetiver grass is grown and widely applied in many areas around the world. In Vietnam, vetiver has been grown and used extensively since early 1990s to prevent erosion and landslide, and to effectively treat the contaminated environment. Therefore, the demand for this grass is growing. However, there are many species of vetiver that have an ecological distribution worldwide. In terms of external morphology, it is not easy to differentiate between the south Indian vetiver (*Chrysopogon zizanioides)* and the local indigenous *Chrysopogon nemoralis*, which is known by the locals as Co De.

Presently, in many areas in Quang Nam Province, Co De, which has morphological characteristics similar to *Chrysopogon zizanioides*, is being exploited and used to prevent erosion and landslide in several projects. However, its performance and effectiveness are not high, thus causing negative impact on the environment as well as psychological doubts about the effectiveness of vetiver.

This paper discusses the confusion between the south Indian vetiver *Chrysopogon zizanioides* and the indigenous Co De *Chrysopogon nemoralis*. Following that, some distinguished characteristics of the two grasses will be highlighted in order to eliminate the confusion, thereby improving the efficiency and usage of vetiver grass.

Key words: Co De (*Vetiveria nemoralis*), indigenous, confusion, erosion, landslides, vetiver grass *(Chrysopogon zizanioides).*

1. Introduction

Bo Bo, a cluster of four small hills with an area of over 200 ha, including two communes Dien Tho and Dien Tien, is located 15 km southwest to Danang City.

In this area an endemic grass known as Co De grows vigourously and has a similar appearance to vetiver grass *Chrysopogon zizanioides*. Therefore, it has been cultured and used

to prevent landslide and erosion, causing it to be often mistaken for *Chrysopogon zizanioides*. In fact, Co De is *Chrysopogon nemoralis*, a native to South East Asia.

This paper aims at describing some characteristics of Co De grown at Bo Bo Mountain, Quang Nam Province and clarifying some features being mistaken easily between Co De and *Chrysopogon zizanioides*. In conclusion, recommendations will be given to local people to distinguish between the two grasses to enhance the efficiency and the usage of Vetiver System in the region. **(**Chomchalow, 2000; Veldkamp, 2005).

2. Materials and Methods

Co De was sampled at Bo Bo Mountain, Quang Nam Province and was examined primarily on external morphology, such as shoot shape, stem height, number of branches, flower shape, reproduction and forms of reproduction.

The growth and development cycles of Co De, as well as its uses and exploitation were surveyed by direct interviews with local people.

3. Results and Discussion

3.1 Morphological features of Co De at Bo Bo Mountain

The stems of Co De at Bo Bo Mountain form bushy tussocks; each one has 16-35 radiating branches with an average height from 0.35-1.15 m. The stem is hairless, slightly curved, forming lots of smooth knots. The distance between two knots is about 20-27 cm.

Figure1. Co De at Bo BoMountain

The leaf blade of Co De is narrow with an average length from 32 to 88 cm, the width from 5 to11 mm, and there are a lot of sharp auricles along the two sides of the leaf sheath.

The root system is fibrous, fascicular, around 30 to 72 cm deep and spread out about 30 cm wide after one year of growth.

Figure2. Root of Co De at Bo Bo Mountain

The flowers are purple and oblong-shaped, adapted for wind pollination.

Figure 3. Fresh flowers of Co De

Figure 4. Dried flowers of Co De

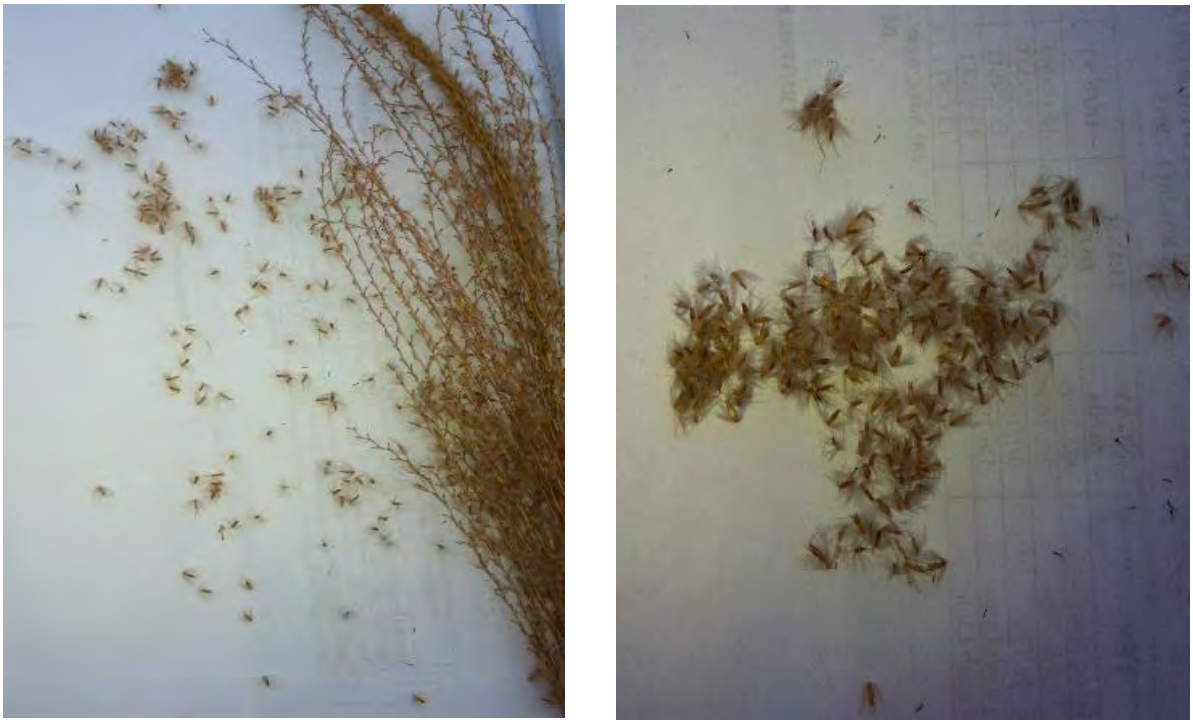

Figure 5. Flowers and seeds of Co De in pollination mode

3.2 Growth and reproduction characteristics of Co De at Bo Bo Mountain

The growth and development period of Co De at Bo Bo Mountain is from late December to February annually. The seeds germinate and grow into seedlings, and the seedlings grow rapidly into mature plants from March to June. During July and August, Co De withers due to dry weather and the shortage of soil moisture in this area. From late September to the middle of November, the matured plants bloom, then dry gradually until late December when the seeds are dispersed by the wind to nearby areas. Thus, the main growth phase of Co De is from February to June, the blooming phase is from mid September to mid November, and the germination phase is from late December to February.

Because the flowers are capable of being dispersed by wind, and seeds germinate easily, Co De has thrived and expanded significantly since 2006. Although local people have taken many measures to eradicate it such as digging out the roots (uprooting) and using herbicides, in subsequent years their seeds still germinate rapidly. As a result, Co De has been widely spreading at Bo Bo Mountain.

Figure 6. Seedling germinates from seed

Figure 7. Seedling after 3 months of growth

Figure 8. Withering Co De in August

Figure 9. Blooming Co De in October

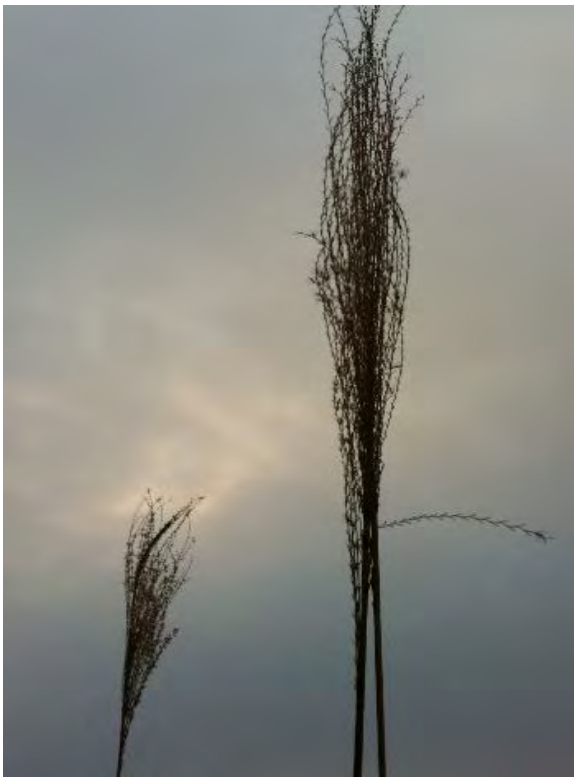

Figure 10. Flowers start to dry and disperse by wind

Figure 11. Flowers after seed dispersing

3.3 Current usage, exploitation and eradication measures of Co De by local people

Presently local people living in Bo Bo and neighboring localities are exploiting and using this grass for the following purposes:

- **Nursery:** Some local people from Da Nang City, Dai An community, Dai Dong community, and Dai Loc District in Quang Nam Province have harvested Co De to cultivate seedlings and then to sell them to people who need planting materials.
- **Exploitation, usage:** Co De are often exploited and used by local people to control soil erosion as well as landslides. This work is carried out continuously throughout the year.

Figure 12. Co De grown along the road in Dien Tien community, Dien Ban District, Quang Nam Province

Figure 13. New plantings by farmers for erosion control on their steep slopes

As the seeds of Co De are wind sown, they are also germinated and established easily in a wide range of environmental conditions. The seedlings are capable of rapid growth and become very invasive, so local people have used the following measures to eradicate this weed:

- Uprooting and sun drying: Uprooted plants are sun dried for 7-10 days and used as fuel.

Figure 14. Uprooting and sun drying plants for fuel

- Using herbicides: The herbicides are sprayed directly on stumps and stems. They die after 1 to 5 days and rot. However, this application is not always possible as Co De often grows in vegetable farms; herbicide spray would have adverse effects on the soil and vegetable quality as well as on human health.

3.4 The basic differences between Co De and *Chrysopogon zizanioides*

This study found that Co De (*Chrysopogon nemoralis*) and *Chrysopogon zizanioides* have some common as well as different morphological characteristics. Both are photophilic flowering plants; they grow as tussocks with lots of branches from the stump; the blades are long, narrow, sharp, and intolerant to shading, have fascicular roots, and thrive in most soil types, notably in vacant land.

These similar features have caused confusion to local people who have been exploiting Co De for controlling erosion and landslide. To reduce this confusion, Table 1 will show some basic different characteristics between Co De and *Chrysopogon zizanioides*:

Table 1: Some different characteristics between Co De and *Chrysopogon zizanioides*

Characteristics	Co De	*Chrysopogon zizanioides*
Stem	- Average height: 0.35-1.15 m. - Small and have thin culms. - Small stems slightly curved with short internodes, 20-27 cm.	- Average height 1.5-2.0 m - Big and stiff - Large and straight stems
Leaf length	32-88 cm	45-100 cm
Root	Length: 30-72 cm after 2 years	Length: 3-4 m after 2 years
Uprooting	**Easy to uproot in tussocks when in the soil**	**Difficult to uproot in tussocks when in the soil**
Smell	**Slight odour**	**Strong fragrance**
Flower	Hermaphroditic, self-pollinating and adapted to wind dispersal	Non pollinating
Seeds	Have the ability to germinate and become seedlings.	Do not have the ability to germinate and have to be propagated by clump subdivision.

From the above chart, we see the easiest way to differentiate between Co De and *Chrysopogon zizanioides* is by the uprooting test; the second way is the smell test, and the third is by their size; *Chrysopogon zizanioides* is much taller and more erect than Co De.

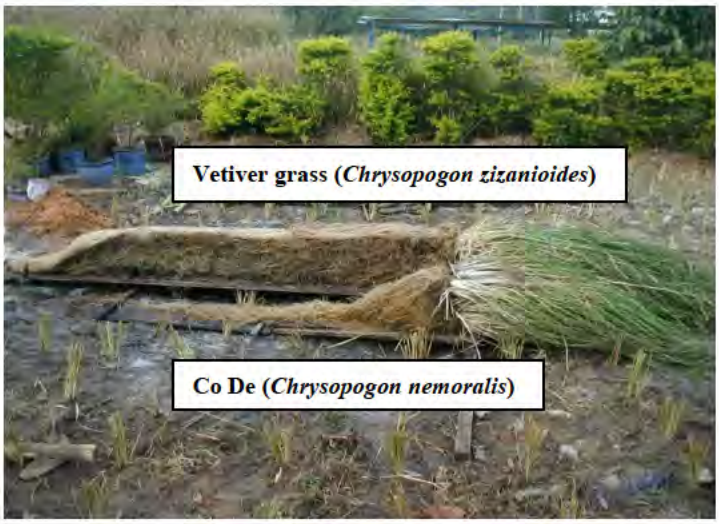

Figure 15. Vetiver has long and massive roots as compared to Co De

3.5 Inappropriate use of Co De

Due to this confusion Co De has been used to stabilize riverbanks in the region (Fig. 16). This is entirely inappropriate, as *C. nemoralis* is an upland species and its normal habitat is on dryland and most importantly its roots are too short.

Figure 16. Co De planting for riverbank stabilization

3.6 Some recommendations about the usage of Co De

Local people should not cultivate Co De because of its invasiveness and its potential to become a bad weed. Do not use this grass for erosion and landslide control because of the short roots.

Local authorities need to coordinate with scientists to help as well as to support local people in order to clarify the difference between Co De and *Chrysopogon zizanioides* for the purposes of erosion control, landslide stabilization and particularly riverbank stabilization.

This is a very critical situation as the banks of local rivers are badly eroded as shown in Figure 17.

Figure 17. Badly eroded riverbanks in the region

4. Conclusion

In terms of morphological characteristics, Co De (*Vetiveria nemoralis*) and *Chrysopogon zizanioides* have many similar characteristics such as shape of stems, leaves, flowers and adaptability in many ecological conditions which can be easily confused.

Although there are many similarities, Co De and *Chrysopogon zizanioides* have many different features such as root length, root odour, plant size and seed sterility.

5. References

1. Chomchalow, N. 2000. The Vetiver Plant. *In:* Manual of the International Training Course on the Vetiver System, 19-30 Nov. 2000. ORDPB, Bangkok, Thailand, pp. 4-5.
2. Veldkamp, J.F.(2005). Courtesy Mark Dafforn, National Academy of Science, Washington, DC, USA.