The Sustainable Uses of Kenaf (*Hibiscus cannabinus*)

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Abstract

Kenaf, an herbaceous annual, soft fiber crop may have the potential for commercial success in the state of Florida due to the high yields that can be obtained in the state's warm climate. The crop can be cultivated for both fiber and seed production. In Central and North Florida, the climate makes kenaf cultivation more suitable for fiber production. The fibers can be used in various ways, such as for papermaking, as a raw material for composites, and as a sustainable oil absorbent to clean up spills. The core, as a waste product of fiber production, has the ability to be utilized as a growth medium for containerized plants and to be used as a filtration aid for pools. In South Florida, higher seed yields are obtained because the climate is more suitable for seed production in the region. Seeds can be utilized as a source of seed supply for other regions, and may even be used as a source of edible oil as a by-product. If the correct measures are taken, kenaf could become a valuable cash crop for the state and a sustainable alternative for use in various industries.

Introduction

Kenaf is an important fiber crop that is commercially grown in various countries around the world, such as India and China. There is also a substantial amount of research being performed in Malaysia. Kenaf can be grown in a diverse range of conditions and has a high resistance to drought (Maiti, 1997). The southeastern United States could benefit from the growth of this crop because of its warmer climate.

The useful parts of kenaf include the seed, the leaves, the flowers, and the stem, which consists of two parts: the outer bast layer and the inner core layer. Traditionally, the crop is cultivated for its fibers, but research has shown that the other parts of the plant can be used as well, rather than thrown into landfills as a waste by-product. Moreover, the crop has potential to have a high commercial value in the state of Florida. due to the high yields that can be obtained.

Figure 1. Hibiscus cannabinus. Retrieved 04/01/23 from https://en.wikipedia.org/wiki/Kenaf#/media/File:Hibiscus_cannabinus0.jpg

Kenaf has become of interest in recent decades because virtually every part of the plant can be utilized for sustainable purposes. The goal of this study is to provide an introductory outline of the various sustainable ways in which the crop can be used. This would show that the industries researched could become less dependent on traditional, unsustainable materials.

Objectives

- Analyze the sustainable ways that each part of the kenaf plant can be used in multiple industries
- Examine the potential for kenaf to be utilized as a commercially valuable crop in the state of Florida

Methods

Literary Analysis

- A literature review was performed and data was obtained from various cited research articles

Field Study

- 134 kenaf seeds of the "whitten" variety were planted in the greenhouse at the BioEnergy and Sustainable Technology (BEST) Laboratory for observational and learning purposes
- After germination, the nursling kenaf plants were transferred to a small plot and planted in the ground

Results

Uses of kenaf fibers

- *Composite making*: Fibers can be used as a raw material in composites for construction, automotive, and medical products, reducing the need for other commonly used materials, such as plastic and wood (Kalaycıoglu and Nemli, 2006; Shahar *et al*., 2019; Chow *et al*., 1998).
- *Oil absorbent*: Fibers can be used to make sorbent sheets and act as an efficient oil absorbent, providing a sustainable way to clean up oil spills (Annunciado *et al.*, 2005). In a study comparing sorbents made from various vegetable fibers, the material made from coarse-grained kenaf had the highest oil absorption value (Shamsudin *et al.*, 2015).
- *Pulp and paper*: Fibers can be used for pulping and papermaking, producing properties similar to those found in softwoods and superior to most hardwoods. Moreover, fibers can be blended with other pulps to improve low-grade quality (Miller, 1964).

Uses of kenaf core

- *Growth media for potted plants*: The core can act as a potting growth media for containerized plants when pulverized into coarse pieces, exhibiting qualities similar to general potting media mixes. The ground core can partially replace peat moss, reducing the need to import this traditionally unsustainable growing media (Webber *et al*., 1999). However, research has shown that more frequent irrigation may be required (Webber *et al.*, 1999; Wang, 1994).
- *Filtration aid*: The core can be used in filtration applications for swimming pools and spas, as a substitute for diatomaceous earth (Lee and Eiteman, 2001).

Uses of kenaf leaves

- *Livestock feed*: The leaves and petioles of kenaf have been shown to have a high protein content, making the them suitable for livestock feed (Killinger, 1969). It has also been found that the leaves have a high percentage of digestible protein and that they can be ensilaged efficiently (Wing, 1967).

Kenaf for seed production

- Research has shown that more temperate climates in which kenaf could be grown for pulp production will not produce seeds (Joyner and Wilson, 1967). Due to the climate of southern Florida, the commercial cultivation of kenaf for seed production is plausible and can serve as a supplier of kenaf seeds for other areas of the United States (Wilson *et al*., 1965).

Figure 2. *Hibiscus cannabinus plant and seeds*. Retrieved 04/01/23 at https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/kenaf.

Uses of kenaf seeds

- *Oil production*: Because of this crop's potential to be grown for seed production in southern Florida, the seeds can be used as a source of edible oil production with a quality similar to that of cottonseed oil (Mohamed *et al.*, 1995). Research has shown that the high phospholipid content obtained from the seeds may act as a natural antioxidant, increasing oil stability and shelf life (Mohoamed *et al.*, 1995).

Conclusions

The literature review and analysis revealed the various ways that each part of the kenaf plant can be used and indicates that there are multiple industries where this crop has opportunity. Moreover, if it were to be cultivated, the need for traditional raw materials, such as peat moss in potting media and wood in papermaking, would be significantly reduced, as kenaf could act as a sustainable alternative. Thus, carbon emissions from the production and transportation of peat moss from Canada would decrease overall and be less of a contributory factor to climate change.

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