

# KENAF IN SOUTH AFRICA: UNLIMITED POSSIBILITIES

By

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# KENAF AS A CROP

A crop closely related to cotton, with an African origin and a 4000 year cultivation history on the continent.

It has become global with:

- A 200 year production history in India.
- Production in Russia since 1902.
- Production in China since 1935.
- Production in the USA, Insonesia and Caribbean.





# **A SHORT HISTORY IN SOUTH AFRICA**

- **Less than 20 years in South Africa.**
- **Limited research since 2005.**
- **Development only on fiber production.**
- **Incentive was driven by the Department of Trade and Industry.**
- **Field trials at Winterton only, through ARC Industrial Crops Institute.**
- **Lack of understanding by local farmers resulted in low quality fiber.**





# GROWTH AND DEVELOPMENT

- Kenaf is drought tolerant.
- Grows in a wide range of soil types – sand to heavy clay.
- Plants may grow up to 4m tall.
- Germination within a week.
- Plants are cultivated until flowering for bast fibre production .
- Bast fibers are extracted from bark.
- Short fibers (0.49mm to 0.78mm) extracted from woody tissue surrounding stem core.







## Flowering and Pollination



Flowering takes place over extended period.

Single flowers open for 1 day.

Self pollinating – pollination occurs during flower closure.

Cross pollination insect dependent ( 2% to 24%





# THE BIG HEAD SHIFT

- DARD Research proposed a new approach to exclusive fibre production.
- First investigation on seed production in South Africa through collaboration between North-West DARD and the ARC Vegetable, Industrial and Medicinal Crops Campus.
- Seed instead of fibre appeared as the primary commodity following





# Research Questions

- **Development of Industry/ Creation of Markets**
- **Development of Effective Cultivation Practices**
- **Pests and Diseases.**





# STRUCTURING FUTURE RESEARCH

- Research has to be outcome based.
- Traditional fibre production will not allow seed production – linked to bast fibre quality decrease after flowering.
- Use of kenaf bio-mass for animal fodder also requires early harvesting.
- Research on agronomy combined with products will have to be structured to still allow seed production as main objective.



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# CREATION OF INDUSTRIES

The Food Packaging Industry has already been engaged to allow product development from mature plant fiber – Packaging Guru.

Contact has already been established with a local manufacturer of support beams for mining and poles for orchard training – SaltusPoles.

Animal Nutrition is already under investigation through collaboration with UNISA.

Seed multiplication through North-West DARD for Kenaf Seed Meal/ Kenaf Oil and Kenaf Milk product development under way





# SOUND REASON FOR DEVELOPMENT

- The search for effective, market competitive and environmentally friendly bio-degradable packaging is relentless.
- Polystyrene and durable plastic products are currently poisoning the environment.
- Undisciplined and unpoliced littering makes South African consumers important contributors to the 8 million tonnes of plastic waste that poisons the world's oceans annually.
- The type of fibres required for bio-degradable packaging will be produced as a cheap by-product of seed production.



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# ANIMAL NUTRITION

13 Phyto-comounds in leaves

8 Phyto-componds in bark

11 Phyto-compounds in flowers

10 Phyto-compounds in Seed

Chemical composition shows little overlap between plant organs.

High fiber content shows promise for rabbit industry.

Nutritional evaluation has begun in collaboration with UNISA.



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# DEVELOPMENT OF SEED POTENTIAL

- Kenaf seed, a possible soybean alternative?
- Seed with 20% edible oil – extraction produces ‘Defatted Kenaf Seed Meal’ (DKSM).
- Kenaf oil considered an equivalent for soya and cotton oil.
- Raw seed protein content between 21% and 35% - with all essential amino acids.
- Further processing produces ‘Kenaf Seed Protein Concentrate’ (KSPC) with 70% protein.
- Processing of textured protein equivalents similar to soja meat alternatives are mentioned in literature.





# KENAF SEED PRODUCTS



- Kenaf milk is similar to almond milk in terms of nutrition and taste.
- Seed contains anti-oxidants that inhibits oxidation of food product lipids.
- Kenaf seed oil fully edible. Literature estimates sustainable, financially viable kenaf production based on oil production only if seed harvests of 1.5 tons/ha can be achieved.



# CULTIVATION

- Kenaf is a daylight sensitive summer crop that flowers when daylength drops below 12.5 hours.
- Optimal densities for fibre production are high – 5cm spacing within row.
- Optimal plant populations for seed production will be determined through field trials.
- Plants flower from lower parts of stems to the top. Seed capsules borne on upper 60% of stems.
- Seed capsules harvested when lower 10% of capsules split open.





# PESTS AND DISEASES

Kenaf flea beetle (*Podagrica testacea*) currently considered to be the dominant pest.

Growth tips with soft tissue and low fibre content preferred. Heavy infestations may defoliate plants.

Considerable overlap with cotton pest complex is expected.

Insect surveys in the North-West Province already added species to known pest complex.



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# PESTS AND DISEASES

- Cotton aphids (*Aphis gossypii*) are not mentioned in literature but were found as colonies in kenaf stands at Makwassie.
- The cotton stinkbug (*Oxycarenus hyalinipennis*) found on kenaf at Taung and Rustenburg (this species has not been previously reported on kenaf).





# PESTS AND DISEASES

- Significant damage to flowers was caused by CMR beetles (*Mylabris* sp.) at the Taung Research Farm.
- The flower at left may be damaged extensively enough not to pollinate.





# PESTS AND DISEASES

- The African bollworm (*Helicoverpa armigera*) was found on kenaf plantings during the 2021/22 season.



- As yet unknown Lepidoptera (pictured) were recorded on kenaf for the first time.



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# PESTS AND DISEASES

- No grasshoppers or crickets are reported from either kenaf or cotton.
- Two grasshopper species were recorded on kenaf at Makwassie during the 2021/2022 season.
- The elegant grasshopper (*Zonocerus elegans*) reduced plant populations by feeding on seedlings.





# NEW CROP RESEARCH AT NORTH-WEST DARD

- Trials on simultaneous leaf and grain harvesting from grain amaranth have been planned.
- An exciting new development is the investigation of amaranth root nutrition in collaboration with UNISA. Roots will be evaluated for their potential use in animal feed.



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# NEW CROP RESEARCH AT NORTH-WEST DARD

- Foxtail millet will be tested in field trials, when sufficient seed has been generated through the seed multiplication programme. This crop is comparable to buckwheat in terms of its rapid yield production.





# KENAF RESEARCH WILL BE GREATLY EXPANDED IN FUTURE

