Castor bean Production

Key things to consider when growing castor bean in Jamaica:

The CARDI experience

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Sources of information for presentation

CARDI's research:

- Assess the performance of Castor bean and Jatropha grown on mined out bauxite lands
- Develop guidelines for the production of Castor bean and Jatropha on mined bauxite soils
- Demonstrate the production of Castor bean and Jatropha on mined bauxite soils to the farming community
- Literature reviews
- Castor bean research activities conducted at Bodles

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Contents

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Brief background

- The castor bean plant (*Ricinus communis*) has been cultivated for centuries
- Thought to be native to tropical Africa and India
- Seeds contain 35 to 55% oil, depending on variety
- The oil has been made famous all over the world for its anti-inflammatory and antibacterial properties.

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Brief background cont'd

- The seeds, leaves, and stems of the plant contain ricin and ricinine, which are poisonous to humans and animals

- **These toxic compounds are not present in the oil**

- Yields of as much as (350-650) kg of oil per hectare, can be obtained when the crop is grown in arid and semi-arid regions, with no crop management applied

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Uses

Has over 700 uses including:

- Medicines (purgative)
- Cosmetics
- Industry: *Aircraft lubricants, hydraulic fluids, biodiesel, linoleum, printer's ink, nylon, varnishes, enamels, paints, and electrical insulations.*
- Castor bean meal is included as a protein source in feed for swine
- Castor bean meal used as fertilizer

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Varieties

- No true variety found in Jamaica due to cross pollination – over 22 genotypes were identified island wide
- Castor beans found in Jamaica are named based on size of seeds(i.e. Jamaica Large, Jamaica Medium and Jamaica Small)
- **Introduced varieties:**
  - **Nordestina** (Brazil)
  - Zibo #5 (China)
  - Zibo #8 (China)

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Varieties: seed description

Zibo #8

Zibo #5

Nordestina

Jamaican Small

Jamaican Medium

Jamaican Large

Source: CARDI Jamaica

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Varietal characteristics of six castor bean varieties (Source: CARDI Jamaica)

Variety	Traits	Best production zones	Disease resistance	Days to maturity	Ease during harvest	Yield (lb./ac)
Jamaica Small	Small seeds	Adaptable	Most major diseases	155	Moderate	1018
Jamaica Medium	Medium seeds	Adaptable	Most major diseases	155	Hard	1018
Jamaica Large	Large seeds	Adaptable	Most major diseases	155	Hard	1200
Zibo #5	Medium seeds	Dry environment	Susceptible	90	Very easy	1768
Zibo #8	Medium seeds	Dry environment	Susceptible	90	Very easy	1768
Nordestina	Large seeds	Semi-dry environment	Moderately resistant	155	Very easy	1500

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Varietal characteristics

Moisture, oil and fibre content of six Castor Bean varieties

Castor bean Variety	% moisture	% oil	% fibre
Local Large A	8.47	45.34	15.52
Local Large B	8.48	45.48	15.25
Nordestina	8.53	45.76	15.88
Zibo #	8.48	43.71	15.77
Zibo #8	8.31	43.18	15.13
Local Small	8.78	43.40	15.57

Source: CARDI Jamaica

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Growth habits

- Castor bean plant is a perennial crop in the tropics
- In temperate zones of China and India, most castor beans are annual
- Seedlings will emerge in 10 – 21 days
- 90 – 160 days growing season
- Commercial varieties grow to a height of 3 -10 ft.

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Growth habits cont'd

- The plant consists of several stems and branches, each terminated by a **panicle (bunch)**. The mature panicle (bunch) is 6 -12 in. long, depending on variety:

  -Zibo varieties average 11in.

  -Nordestina and local varieties 10 in.

  - Panicles bear (15–80) **capsules** and each capsule contains 3 seeds

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Panicle

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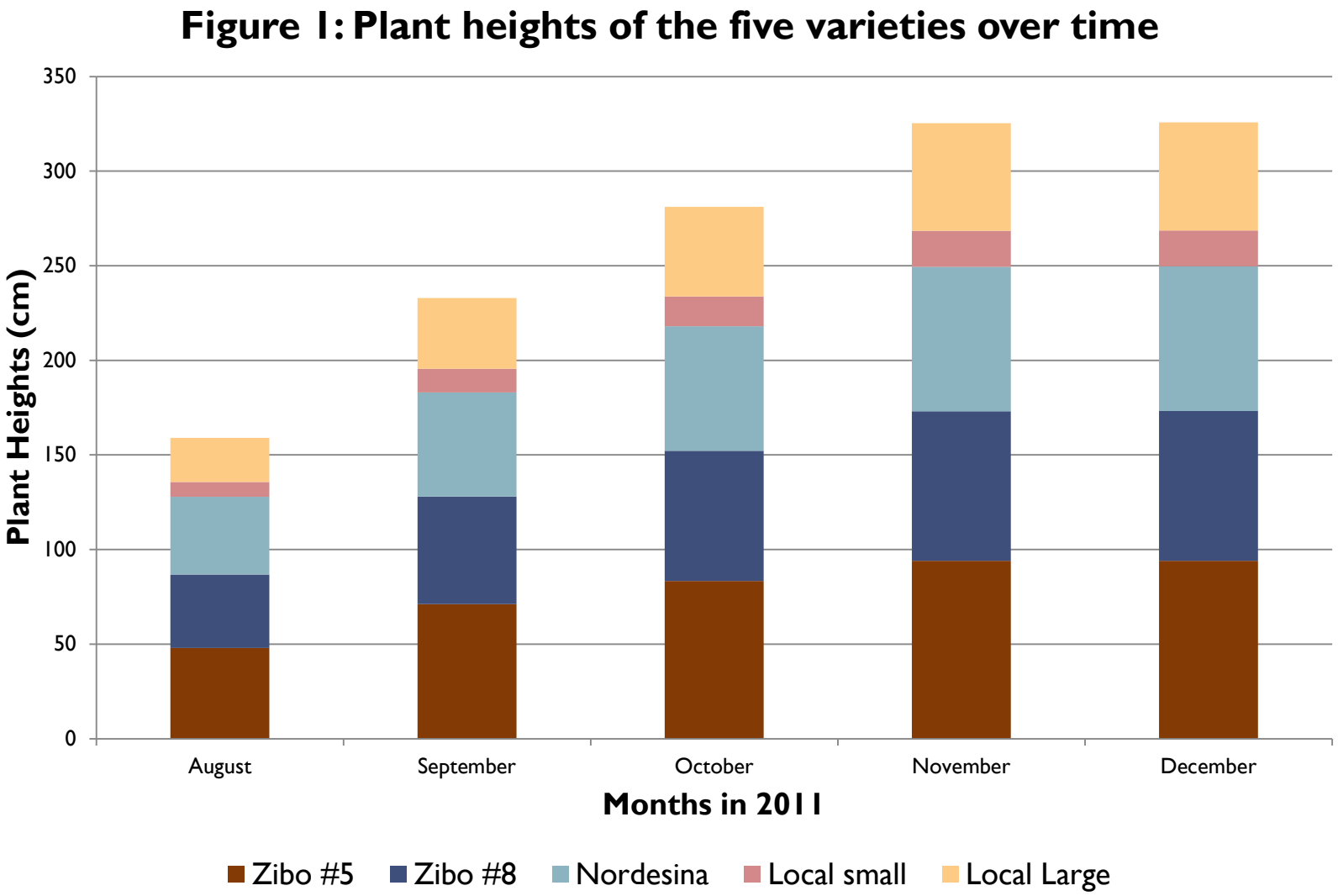
Panicle

Capsule

Growth habits cont'd

(Source: CARDI Jamaica)



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Pruning

Manipulation of the castor bean growth through the pruning, at different planting densities, concluded that the nipping of the apical shoot at the 6th; 10th and 14th node of the main stem, reduced the plant height, but it did not affect seed yield. **Morphological characters of four varieties of castor bean (Ricinus communis L.) in response to pruning lateral branches. https://www.thefreelibrary.com**

Environmental requirements

- **Growing season**: Castor bean can be grown all year round
- **Climate** : Castor beans grow best where temperatures are between 25 – 35°C
- **Soil:** Can grow on all soil types (either alkaline or acid soils / **pH range of 4.5 – 8.3**); as long as the sub-soil is permeable and there is good drainage.

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Environmental requirements cont'd

NB: Whether in heavy continuous rainfall or drought, castor will strive on marginal or mined out bauxite lands

Nordestina was developed by EMBRAPA (Brazil) in 1990 for semi-arid environments and hand harvest

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Germination

- Germination test should be done to determine seed viability
- Seeds should be treated with fungicide before planting (optional)
- **Thiram** (dimethylcarbamothioylsulfanyl N,N-) is the only registered seed treatment fungicide for use on castor beans
- Phython 27(Copper Sulphate Pentahydrate) is used in Jamaica
- Seedlings normally emerge 10 to 21 days after sowing

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Seed selection

- To collect castor bean seeds, break open the seed capsule (pod). There are three castor seeds per capsule (pod). Sometimes not all the seeds in the pod are large enough to keep. Discard any castor bean capsules (pods), or seeds that are small, they won't be mature enough to germinate.

- Artificial, low temperature storage affects the viability.

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Seed selection

- Castor seed stored at 5 to 7^{0}C temperature for 6 months reduced the germination from 93 to 3%.
- Introduction of foundation seed from Brazil in order to maintain seed viability and varietal integrity

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Land preparation

- Plough or disk the land

- If the plot is going to be irrigated, place the drip lines - emitters at the recommended plant spacing

- If the area is prone to water logging, plant on ridges

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Land preparation

Planting on ridges; Farm of Matthew Jones in Clarendon

Time of planting

Variety	Time of planting	Days to maturity
Nordestina	Both wet and dry season	155
Zibo #5	Dry season	90
Zibo #8	Dry season	90
Jamaican (local)	Both wet and dry season	155

Source: CARDI Jamaica

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Planting(direct seeding no irrigation)

- Germination can be poor, so farmers are encouraged to place (2-3) seeds per hole and then "thin–out" after planting
- Recommended seeding rates of (10-14) lbs. per acre, will give optimal plant stand
- Seedlings can also be transplanted, preferably with the use of irrigation

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Planting cont'd

- Because the main lateral roots of the castor bean plant are near the soil surface, cultivation can shallow.
- Ensure the soil is moist at the planting depth of (1–3) in, before planting
- **Mechanical planting**: Corn planter with an air metering system are suitable. N.B. castor beans are very oily, break easily and can clog up machines.

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Planting density

- **Plant density**: Is dependent on tree architecture i.e. plant height and branching.

Recommended planting distances are:

6 ft. x 9 ft. for large plants

5 ft. x 7 ft. for medium plants

5 ft. x 6 ft. for small plants

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Weed control

- The slow emergence and slow early growth of castor bean, means the plants are not strong competitors against weeds.
- Therefore, weed control is of great importance **in the first 2-3 months of growth.**
- Because the main lateral roots of the castor bean plant are near the soil surface, mechanical weed control, in the immediate vicinity of the plant, is not advised.

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Weed control cont'd

- Use of **pre-emergent** herbicides will give young plants adequate time to establish, before weed competition
- Weedicides can also be applied on emerging weeds
- When the plants are established, a cover crop (pumpkin, beans and sweet potato) can be planted to help control the weeds *(with the added benefit of income generation)*

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Fertility recommendations

Ideally, fertilizer recommendations should be based on soil and leaf analysis

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Generic fertility guidelines (without soil / leaf analysis)

- The most important factor for soil fertility, is the supply of nitrogen in the soil
- Insufficient nitrogen results in reduced castor bean yields
- Excessive nitrogen produces heavy vegetative growth with little or no increase in seed yield
- **Castor beans do not generally respond to phosphorus, and excess soil phosphorus levels can actually decrease yields.**

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Pests and their control

Red spider mite,

- Control –spray with Caratrax® (lambda cyhalothrin)

Snails

- Use slug bait at the recommended rates
- Organic control - grind tobacco seeds and leaves into powder and apply powder to seedlings

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Pests and their control cont'd

Source: CARDI Jamaica

Red spider mite infestation

Disease and their control

Gray mould

- Control- apply fungicide- Ridomil® (mefenoxam) and/ or Top Cop® (Tri Basic Copper Sulfate, 50% Sulfur)
- Organic control – apply neem oil

stunted growth

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Disease and their control

Gray mould

Poor developed seeds

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Disease and their control Cont'd

Snail infestation

Removal of succulent leaves

Pest and Diseases

- Resistance to various diseases varies among castor bean **varieties**
- During periods of **heavy rains or dews**, capsule moulds, **Alternaria leaf spot** and bacterial leaf spot may occur
- Alternaria leaf spot is more severe in nitrogen-starved plants
- Other diseases may occur, particularly in wet seasons

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Maturity

- Description – the outer coat of capsule is removable.

Source: CARDI Jamaica

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Maturity cont'd

- Monitoring – the local varieties should be harvested, when the coat covering capsules, is removable. This prevents pre-mature seed dispersal.
  - Harvest the spike as soon as the colour of capsules changes from green to yellowish brown and few capsules start drying.
- Based on the variety, 15-30% of panicles should be dried.

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Maturity cont'd

15 % of panicle being dried

Seed dispersal

- Spiny seed pod or capsule composed of three sections or capsules
- Each carpel contains a single seed
- Capsules split apart at maturity as the pod dries
- Seeds often ejected with considerable force.

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Harvesting sequence

- On an average, castor produces 4-5 sequential order panicles which can conveniently be harvested in 3-4 pickings, starting from 90-120 days, at intervals of 25-30 days. **Premature harvesting leads to reduced seed weight, oil content and germinability**.

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Harvesting

- Harvest the panicle when 30% of the carpels are dried

Disadvantages:

- Local varieties (one may lose up to 50% of seeds due to seed dispersal)
- Nordestina and local varieties require pole pruner for harvesting due to height of trees at harvest

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Post-harvest

Drying

- To prevent loss of seeds when capsules erupt, harvested castor beans should be placed in a **drying house**
- Seeds may be separated from capsules either manually or mechanically.

Storage

- Seeds can be stored in pods or shelled and placed in aeriated bags
- Seeds should be stored in a dry cool place, at room temperature and at less than 6% moisture

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Post-harvest

Storage

- Castor seed should not be stored in the open, as **both heat and sunlight damage the germination and reduce the oil content**.
- Foreign material, and cracked or broken beans are considered in grading the seed

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Yield potential

Yields vary and are dependent on:

-Variety

-Season planted

-Soil type

-Agro-ecological zone planted

-Cultural practices and

-The care exercised during harvesting and storage

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Yield performance

Variety	Location	Condition	kg/ha	lb./ ac
Nordestina	Bodles St Catherine	Irrigated on fertile soil	1696	1513
Nordestina	Sam Motta, Manchester	Rain fed on marginal soil	1450	1293
Local varieties	Sam Motta, Manchester	Rain fed& marginal soil	630	562
Zibo varieties	Bodles St Catherine	Irrigated on fertile soil	1982	1768
Zibo varieties	Sam Motta, Manchester	Rain fed on marginal soil	250	223

Source: CARDI Jamaica

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THANK YOU

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