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MOPANE WORMS¹

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¹ Assessing the potential of insects as food and feed in assuring food security. Technical consultation meeting, 23-25 January 2012, FAO, Rome, Italy.

Distribution

Imbrasia belina is widely distributed in the eastern half of southern Africa and further north into eastern and central Africa. This includes the extreme north of the Limpopo Province in South Africa, north-eastern Botswana, northern Namibia and parts of Zimbabwe and Mozambique and is not restricted to mopane woodland areas.

Factors influencing yield

Fire

Research in Malawi has shown that experimental plots subjected to yearly early burning (June/July) over the past 15 years produce significantly larger caterpillar yields (26.19 kg ha⁻¹) compared to unburnt plots (11.09 kg ha⁻¹), while late burnt (September/October) plots produce the lowest yield (6.61 kg/ha). It was theorised that early burning creates an environment conducive for the moths' eggs and larvae to survive, possibly by reducing the number of potential predators.

Forage tree height preference

Yields of *I. belina* vary with forage tree height and species interaction. In Kasungu National Park (Malawi), *I. belina* occurs in highest numbers on *Brachystegia spiciformis* below 3 m, while on *Julbernardia paniculata* it is more abundant from 3 m to 10 m. If the height preferences of *I. belina* on *J. paniculata*, *B. spiciformis* and *Brachystegia bohmeri* are converted to yield per tree height, the highest yields are recorded from 1-3 m, followed by 3-10 m and 0-1 m height classes, with the lowest yield at heights exceeding 10 m. The oviposition behaviour of *I. belina* moths is probably density dependent with more egg clusters laid on bigger trees with increasing moth density.

Predation

The various stages of the life cycle of *I. belina* provide food for numerous natural predators. The various life cycle stages are eaten by at least 20 other species of insects, as well as four reptile species, 34 bird species and 10 mammal species (including jackals, bat-eared foxes, warthogs, aardvarks, bats, baboons and vervet monkeys).

Life cycle

Eggs

- Hatch in summer
- There may also be a second generation in February to March

Caterpillar

- The young caterpillar feed on the leaves of the tree where they hatch
- As the larvae grow, they moult four times before they reach their maximum size.
- About 10% of the worms should be left to complete their life cycle to ensure adequate moth numbers for the next outbreak.
- Should a caterpillar be confronted with a reduced supply of nourishment, it will migrate in search of another source. This can lead to mass migrations and columns can stretch over a distance of 5km.

Pupae

- Mature larvae move down the tree onto the ground where they excavate a burrow 15 cm deep in which they pupate
- The pupae is important as an over-winter stage

Moth

- Moth emerge at the beginning of summer
- They do not feed and only live for 2-3 days
- Their only functions is to mate and produce eggs

- The female lays 50 to 200 eggs on the leaves of branches of trees, mostly mopane trees.
- Since the moths do not eat and only live for two to three days, they will not be capable of long flights to repopulate areas that have been over-harvested.

Nutritional value

One of the key advantages of dried mopane worms is that they have three times the protein content of beef by unit weight, and can be stored for many months. Mopane's nutritional value exceeds that of other sources of protein such as chicken, milk and beef. Its energy content is 444 calories/100 gramme (protein content is 56.8 grammes), which compares exceptionally well with the corresponding figures for cooked beef of 172 calories (22.6 grammes); raw chicken 146 calories (20.5 grammes); cows' milk 79 calories (3.8 grammes) and goats' milk 85 calories (3.4 grammes). It is maintained that 100 g of dried worms provides up to 76% of a humans daily protein need, and many of the required vitamins and minerals as they contain significant amounts of phosphorus, iron and calcium. Mopane worms are also rich in unsaturated fatty acids, as the fatty acid composition for total fatty acids and unsaturated fatty acids is reported to be 40.5% and 57.0%, respectively. In addition, the consumption of mopane worms also provides in the intake of a certain amount of roughage. In the light of these statistics mopane worms can clearly play a vital role in human survival in times of economic and climate stress.

Economic value

There is little doubt that the trade in mopane caterpillars provides a valuable source of income for many poor rural subsistence farmers, which although modest in terms of monetary value, can nonetheless form a significant proportion of their annual income. Most agree that the mopane worm trade is the largest veld product commercial activity in Botswana, and may be second only to agriculture as the source of livelihood for the rural communities in the mopane woodland.

Mopane worm sales are clearly an important commercial enterprise, over and above subsistence consumption and sale within rural villages. It is estimated that in South Africa 16 000 metric tonnes are traded on the commercial market, some of which is used as animal feed.

Where values are available, it would appear that the price paid for mopane worms range from US \$2.50 to \$4.00 per kg which compares favourably with that of beef which retails at approximately US\$4 per kg. For low-income earners, mopane worms clearly is a cheaper source of protein and is often more readily available for the poorer households in the harvesting seasons.

Conservation

Reports from rural mopane woodland communities have indicated that caterpillar abundance is declining, due to a number of factors. The most important are:

- Increased exploitation due to commercial gains
- A decrease in selective harvesting
- Deforestation of mopane woodland
- Increasing drought via climate change
- Predation
- Browse quality
- Insecticides on crops and chemical pollution of water, soil and air
- Strong lights (mercury vapour) around factories and similar installations can also interfere with orientation during mating and oviposition flights after mating
- A combination of all of the above

Imbrasia belina is a natural renewable resource that could be harvested sustainably. Research on its ecology and population dynamics is imperative before sustainable harvesting levels can be set. Nature conservation in South Africa has traditionally

focussed on the big five at the expense of creatures such as *I. belina*, which are less spectacular but more relevant to rural communities.

It is important to look at management of the trade and commercialisation as the harvesting of mopane worms creates employment opportunities for the illiterate and the unskilled. It uplifts people living in and around mopani veld, an area which otherwise appears to offer little industrial potential. South and southern Africa, with problems like regular drought and affordable food shortage for the extremely rural poor, will likely remain an important consumer of these worms.

Mopane worm recipe

Ingredients: 1 cup of salt & 3 cups of fresh mopane worms

Recipe:

Align 4 or 5 worms in both hands & squeeze like milking a cow

Discard liquid guts, Boil worms in salt water until water evaporates (about 30 minutes), Spread worms out on empty bags in the sun, turning every hour until dry (about 1 day), Enjoy.









