

Dispersal ecology of the !nara-melon along the Kuiseb River, Central Namib

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1. Introduction

The !nara-melon (*Acanthosicyus horridus*) is a leafless dioecious cucurbit which grows endemically in the fog belt along the western margin of the Namib Desert. Its taproot which reaches down to the groundwater table allows the adult plant to produce up to 500 fruits of 0.3-1.0 kg in weight, even in places where surface water is scarce. – Due to its high protein and water contents, the fruit, on the one hand, is an important nutrient source for a broad spectrum of animals, and, on the other hand, plays a central role as food and trading object in the livelihood of the Topnaar hottentots.



Fig 1: !nara (*Acanthosicyus horridus*) at Sossusvlei, Namib Desert.

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Since the beginning of the 1990s, a steep decline in fruit production of the !nara population along the lower Kuiseb river was noticed. Major reasons are assumed to be the increasing groundwater use, changed harvesting methods, or ecological factors. Despite the key role of the plant, however, until then little was known about the ecology of the !nara.

Responding to the need for more knowledge about ecology, trading ways and habits, harvesting methods and population dynamics of the plant, the Topnaar Community Foundation in a joint venture with the DRFN (Desert Research Foundation of Namibia) initiated the NARA-Project, in order to address the most urgent questions. From an ecological viewpoint, one central aspect was the dispersion ecology, which then became the focus of my Diploma (MSc) thesis (Müller 2000).

2. Main research questions

- Is the declining fruit output caused by internal dynamics of the plant population? Is the population regeneration reduced by the decreasing number of establishing events?
- Oryx (*Oryx g. gazella*), jackals (*Canis mesomelas*) and the free roaming donkeys of the Topnaar hottentots are known as consumers of the !nara. Do any one of them function as seed dispersers? Do seeds survive the passage through the intestines? Which percentage? How far and in which directions are seeds being spread? Does endozoochory of !nara seeds influence seed predation and germination? Under which circumstances do !nara seeds germinate and where would they be able to establish plants (judging from the growth conditions in areas where adult plants are present)? Could the dispersal distance and placement of faeces help the plant to reach places of possible establishment? Does endozoochory of !nara seeds influence further seed predation and germination?

3. Results

Using a GPS, the entire !nara population (shown as dots) as well as specific habitat conditions in the investigated area around Gobabeb were mapped, so that spatial distribution patterns could be analysed and displayed in GIS software.

By this method, it was possible to overlay the !nara distribution and the outlines of palaeo-channels (former riverbeds, now sand-covered, but still containing water at depth between 10 and 80 metres below the surface). From the correlation of palaeo-channels and surface topography the distance between surface and water resources was calculated. Plant size and spatial distribution of the !naras show a correlation with distance to palaeo-channels ($\text{Chi}^2: p < 0.0001; n = 759$). This correlation is significant down to a distance of 50m to available water resources and supports the assumption that taproots of the !nara are able to reach that deep. To address the question on relevant dispersers, around Gobabeb and at Sossusvlei a total of 800 pellets were collected from approx. 80 heaps of oryx faeces, 2 ostrich droppings, 1 hyena dropping, 256 samples from 60 heaps of donkey dung, several springbok droppings, and 63 jackal droppings. The samples were squeezed between the fingers, and searched for !nara seed shells or intact seeds.

Most seeds found in jackal droppings were still able to germinate (as could be shown by chemical tests and germination trials). Not a single intact seed was found in any other faeces. So it is apparent, that the Black-backed Jackal is the most important if not the only long-distance disperser in the area under investigation. Experiments showed that gerbils (*Gerbillurus* spp.) put a high predation pressure on !nara seeds. Contrary to our expectations, seeds dropped in jackal faeces are not protected but were found distinctly more often than bare ones. Moreover, it was found (in 32 cases) that gerbils store their seeds in scatterhords of 2-5 seeds which puts them in a potentially ideal position (4 cm deep, spread over 10-50 m from the place where they were found) for germination and establishing.

In search for germination conditions a successful method was found and systematically improved which could be an important tool for further research on establishing ecological knowledge, as well as cultivation and management plans.

4. Conclusions and outlook

The !nara plant is an ancient source of living for humans and animals in the lower Kuiseb region. The increase in groundwater use, the loss of traditions regulating the harvest and the changing living habits and conditions along the Kuiseb seem to put the plant population through changes with unsure direction. The !nara plant is depending on groundwater conditions, and the effect of water use changes have to be taken into account. – The Black-backed Jackal plays a crucial role in dispersing !nara seeds which so far has not been acknowledged; rather, jackals are still widely hunted due to their reputation as alleged goat thieves.

From 1998 until present, key plants were measured and monitored several times. These measurement in combination with remote sensing methods are supposed to give a better understanding of establishing and growth dynamics. Preliminary results of the NARA project were published in *Henschel et al* (2004).

Analyses are not completed yet, and lots of questions on the !nara ecology have not been addressed yet. Potential future projects could put further focus on cultivation methods (not only planting seedlings, but cutting methods on adult plants), nutrient fluxes and further uses, as well as on more detailed ecological investigations. For further information please visit www.drfn.org.na or send an email to mueller-gis@web.de.

5. Acknowledgements

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6. References

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