

# AN UMBRELLA FOR GRAZERS IN A PARADISE OF THORNS

by Antoni V. Milewski



The umbrella thorn, *Acacia tortilis*, has become an icon for the game reserves of Africa, partly because of its distinctive shape. In ecological terms, it is indeed a flag for the vegetation? ~ype richest in large mammals anywhere on earth, because It IS one of the few trees designed to thrive in a natural grazing lawn. It has a relationship of mutual benefit with large mammals, which acts to eliminate other trees in this environment. Its design invites herbivores not only to rest in its shade, but also to eat its leaves and fruits. In return, large grazers not only fertilize, water and weed umbrella thorn, but also plant its seeds.

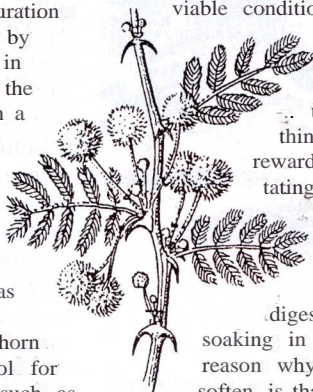
Umbrella thorn not only co-exists with lawn-forming grasses, but itself functions like a lawn on stilts. The leaves are not necessarily richer in nutrients than other green leaves in African savannas, but umbrella thorn is relatively free of defensive chemicals. The nearly two-dimensional sheet of foliage continually regenerates from buds on the stems, which are protected just below a clipped surface. The thorns do not deter browsers, and help them indirectly. A combination of straight and hooked thorns prevents small and large antelopes alike from stripping the buds, which promptly replace plucked leaves. The canopy, above the reach of even giraffe, has a different configuration of thorns suited to herbivory by baboon, vervet monkey and, in places, hyraxes. If not eaten, the small leaves are soon shed in a green state anyway. They are then retrieved by dikdik, the smallest hoofed animal in this habitat, which is too small to reach even the saplings. Even in the dry season, the leaves are twice as rich in protein as lawn grass.

The flat top of umbrella thorn is a virtually evergreen parasol for water-dependent herbivores such as wildebeest, which are dark enough to heat up rapidly in dry, sunny savanna. Its habitat is accessible to both drought-tolerant gemsbok and water-loving waterbuck. Shade-seeking animals concentrate dung and urine derived from the open surrounds, enabling the tree to produce leaves through most of the dry season. In the wet season, shade-tolerant herbaceous plants compete vigorously for the nutrients attracted by the tree. However, these natural weeds attract additional trampling and herbivory, and tend not to be flammable even when dry.

Grasses, nourished by dung and urine, find plenty of nitrogen in the soil. They do not fix atmospheric nitrogen, which would cost photosynthetic energy better devoted to growth of new leaves. Umbrella thorn is competitive in a lawn, partly because it is able to fix nitrogen to produce new protein while the plant is still too low to form a flat top. Even as a sapling, umbrella thorn spends its energy on a continual round of leaves and flowers, rather than growing its

stem out of reach of small herbivores. After a period as long as half its lifespan, the plant forms a canopy that pays for itself in protein, and can produce so many fruits that some seeds survive.

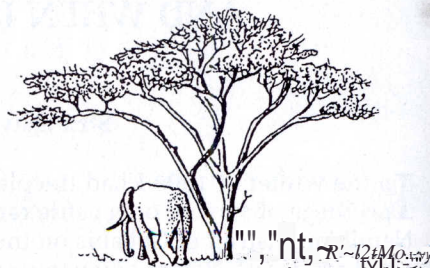
The ripe, dry fruits of umbrella thorn have an attractive smell, and contain a mineral nutrient formula similar to that of good-quality hay. These pods fall at the driest times, when grazing is poor. Their curly shapes are easy to pick up for lips of all sizes: hare, antelopes and elephant. Umbrella thorn is dispersed and sown exclusively by mammals that swallow the seeds together with a nutritious wrapping, and pass some seeds in viable condition. Unlike other fruits,



these pods cater for routine consumption of most of the seeds themselves. Although the thin p...lining the Pods rewards herbivores for regurgitating or defaecating the seeds far from the parent tree, most of the protein is in the seeds. Many seeds are re-chewed and digested by ruminants after soaking in the stomach. However, the reason why many of these swell and soften is that they have been drilled by small bruchid beetles while in the pods. Intact seeds are so hard and smooth that some escape chewing by a range of tooth sizes.

Seeds germinate in the faecal pellets of hares, as well as in those of the mature male elephant, which are larger than the whole hare. Seeds can be easily found by breaking the pellets of the eland. Giraffe pellets generally contain no recognizable seeds, although similar in size and external appearance to those of the eland. The giraffe has yet to be proven to disperse and sow acacias, although shoots of umbrella thorn and other acacias are its favourite food.

Birds hardly help or harm umbrella thorn, although many seek shelter and insects in it. Loeries and mousebirds sometimes eat flowers and small shoots. The fruits attract few birds other than loeries and partots, which sometimes consume premature, green pods. The ostrich eats the mature seeds, which are surprisingly seldom taken by guineafowl, francolins, sandgrouse or doves. The ostrich grinds up all seeds



larger than a pinhead, and seems to waste much of the protein in its faeces. Hence, like the giraffe, the bird cheats umbrella thorn. However, in compensation, the ostrich seldom browses foliage or flowers from the acacias abundant in its habitat. This may be because the bird is deterred by long thorns which could damage its indispensable eyes. I have observed ostriches browsing from shrubs with short, hooked thorns.

Because the seeds of umbrella thorn are destroyed mainly by rodents, not birds, it is aided by antelopes such as the springbok, which make faecal middens on bare ground. When good rains follow drought, seedlings emerge free of competition from adult trees, and temporarily spared from herbivory and fire. The result is that umbrella thorn regenerates in episodes, at intervals of several decades. For example, Serengeti Research Station was grassland when established in the sixties, but has since become a regenerating stand of umbrella thorn and other acacias. The first scientists who worked there were alarmed when elephants broke stems and stripped bark of the few original trees, but have since learnt that damage is part of a greater system of benefit to umbrella thorn.

In which environments can a plant afford to attract animals large and numerous enough to strip and kill it? Umbrella thorn is very widespread in Africa and Arabia, but only on nutrient-rich alluvial and volcanic soils. It tolerates the aridity of the Namib, but not deep sands, except on the fertilized sites of former kraals. In response to the naturally great numbers of wild and domestic ungulates in Africa, it maintains a competitive edge over other woody plants by encouraging recycling of key nutrients by its consumers. It seems that the richness of the ground and the inevitability of herbivory have given plants here little choice but to be generous. Not only its flat top, but also its thorns signify, that umbrella thorn depends on its consumers' as much as they depend on it. ®

The illustrations of *Acacia tortilis* by Rosemary Wise are taken from the delightful new book *Field guide to the acacias of Zimbabwe* by Timberlake, Fagg and Barnes,

December 1999 (page 190).

