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Barrier plants in South Africa

L. HENDERSON*

ABSTRACT

It is stated that there is a need both to extend the range of barrier plants available in South Africa, and to replace some much-used exotic species that have become invasive. A literature survey and computerized herbarium search revealed that of the 428 plants recorded as having been used as barriers 62% are exotics. Of these, 26% are naturalized or invasive in one or other part of South Africa. Ideal characteristics for different types of barrier plants have been defined and used as a guide in selecting a range of potential barrier plants from the indigenous species available. Lists of recognized barrier plants are given including some species revealed as a result of the present investigation.

RÉSUMÉ

PLANTES POUR HAIES D'AFRIQUE DU SUD

Il est établi qu'il y a un besoin d'étendre la gamma des plantes pour haies disponibles en Afrique du Sud et de remplacer certaines espèces exotiques très utilisées qui sont devenues envahissantes. Un relevé de la litérature et une recherche en herbarium par ordinateur ont révélé que parmi les 428 plantes enregistrées comme ayant été utilisées comme haies, 62% sont exotiques. Parmi celles-ci 26% sont naturalisées ou envahissantes dans l'une ou l'autre partie de l'Afrique du Sud. Les caractéristiques idéales pour les différents types de plantes pour haies ont été définies et utilisées comme guide dans le choix d'une gamme de plantes pour haies potentielles à partir des espèces indigènes disponibles. Des listes de plantes pour haies connues sont fournies, incluant certaines espèces qui ont été reconnues à la suite de la présente investigation.

INTRODUCTION

Since the earliest times man has used plants to create physical barriers: as protection against wild animals and enemies; for shelter of dwellings, gardens, crops and livestock against injurious winds; to hide unsightly buildings or features of the environment; to provide privacy and for many other uses. Whereas in early times indigenous plants were used, the great majority of barrier plants in use in South Africa today are exotic.

There is a need to broaden the range of barrier plants available for various uses in different parts of South Africa. The different kinds of barrier plants needed include decorative hedges, windbreaks and security hedges. The environmental conditions where they are needed range from the deep soiled, humid coastal areas to the shallow soiled areas of the arid interior, where great temperature fluctuations are experienced.

In addition to the general need to extend the range of barrier plants available, there is a particular need to replace many of the exotic species presently in use, which have become invasive, threatening the pasture and tourist industries, and the indigenous flora. (Stirton, 1978).

As a first stage in meeting these needs, a literature and field survey has been undertaken to identify and characterize exotic and indigenous barrier plants that are currently in use, and indigenous species with potential as barrier plants.

* Botanical Research Institute, Department of Agriculture, Private Bag X101, Pretoria 0001, South Africa.

LITERATURE SURVEY AND COMPUTER SEARCH OF NATIONAL HERBARIUM

No comprehensive study of barrier plants in South Africa has previously been undertaken, but substantial information is contained in 'Tree-planting in South Africa' (King, 1951), 'Characteristics and uses of trees and shrubs' (Poynton, 1972), and Department of Forestry guides to tree-planting and shelterbelts in South Africa (Fenn *et al.*, 1973; Haigh and Wilhelmij, 1973; Van Rensburg, 1973; Fenn *et al.*, 1974; Van Rensburg, 1975; Keet *et al.*, 1978; Van der Merwe *et al.*, 1978; and Wessels *et al.*, 1978). Other, less substantial, references are widely scattered in the literature, but in most cases these emphasize only the decorative qualities of the plants listed.

To add to the literature survey, a computer search was made of references to barrier plant usage on specimen labels in the National Herbarium, Pretoria.

CHARACTERIZATION OF BARRIER PLANTS AND FORMS OF USE

As an aid to analysis of the barrier plants available and those needed, the ideal physical, biological and horticultural characteristics of the various kinds of barrier plants were listed. Three major categories were considered: garden hedges, windbreaks/shelterbelts, and security hedges. Each of these is discussed below.

Garden hedges

These are primarily decorative barriers which may be clipped to form neat and attractive shapes. They are used to provide privacy or to partition areas within a garden.

Physical characteristics
Growth form — woody shrubs and succulents
Morphology — multi-stemmed from the base or low-branching; dense foliage and closely arranged branchlets; should not be too thorny or difficult to clip.

Biological characteristics
Should respond well to cutting
Non-poisonous; non-irritant
Easy propagation and establishment by seed or vegetative means
Rapid growth; longevity/permanence
Disease and pest-free
Non-invasive

Horticultural characteristics
Attractive foliage, flowers and fruit

Windbreaks/shelterbelts

These serve primarily to break the force of winds, and to provide shelter to people, animals and farmsteads (shelterbelts) and orchards and crops (windbreaks).

Physical characteristics
Growth form — woody shrubs and trees
Morphology — low-branching and dense evergreen foliage; a minimum height of 5 m in most cases.

Biological characteristics
Tolerance to wind, and in coastal areas, to salt-spray
Easy propagation and establishment by seed or vegetative means
Rapid growth; longevity/permanence
Disease and pest-free
Non-invasive

Security hedges

These are primarily to prevent the passage of animals and people.

Physical characteristics
Growth form — woody or succulent shrubs or low-growing trees
Morphology — sturdy; multi-stemmed from the base or low-branching; dense branching; rigid or entangling branches; spreading crown; small sparsely distributed leaves that will cast little shade
Plant armature — spines, prickles, thorns.

Biological characteristics
Resistant to fire, trampling and browsing
Little attention or upkeep required after planting out
Capacity for regeneration if damaged
Ability to grow under a wide range of climatic and soil conditions
Irritant action through stinging hairs, latex or other means
Easy propagation and establishment by seed or vegetative means
Rapid growth; longevity/permanence
Disease and pest-free
Non-invasive

Combination of functions

On the outskirts of towns, and around farm gardens there is frequently a need for garden hedges to double as security hedges. For this purpose plants are required that combine decorative qualities with impenetrability.

Farmers also often like their shelterbelts to double as security fences, keeping the cattle in or out.

A useful measure of where the emphasis lies, is whether mixed plantings are acceptable or not. In garden hedges and sometimes in shelterbelts, uniformity is required and mixed plantings are unacceptable. In security hedges there are no such restrictions and any plant that contributes to the permanence and impenetrability of the barrier is welcome.

Combination plantings

Four categories have been used to classify the species needed for mixed plantings: framework plants, short fillers, tall fillers, and entanglers.

Framework plants are plants which will form the main framework of the barrier and ideally should have the aforementioned characteristics. It is unlikely, however, that they alone will form an impenetrable barrier and other plants will be required to fill in gaps and to strengthen the barrier.

Short fillers fill gaps between the ground and the lowermost branches of the framework plants. They should have many, rigid branches and be tolerant of shade.

Tall fillers fill gaps in and add height to the barrier. They should be much-branched but cast little shade.

Entanglers are plants which will thicken up the barriers as a whole and add to the difficulty of penetration. Suitable plants are prickly climbers which do not cast much shade.

RESULTS AND DISCUSSION

General analysis

The literature survey and computer search yielded the names of 428 plants used as barriers of various kinds in South Africa (Table 1). Of these, 294 (62%) are exotics, and 75 (26%) of the exotics are naturalized or invasive in some part of South Africa (Stirton, 1978; Wells *et al.*, 1980; Duggan & Henderson, 1981; and Balsinhas *et al.*, in press).

Exotic barrier plant species that are now pests in the country include:

(1) *Opuntia* species (Prickly pears), *Caesalpinia decapetala* (Mauritius thorn) which have been used as security barriers.

(2) *Leptospermum laevigatum* (Australian Myrtle), *Nerium oleander* (Oleander), *Hakea gibbosa* (Rock Hakea) and *Duranta repens* (Forget-me-not bush) which have been used as hedges.

(3) *Acacia saligna* (Port Jackson Willow), *Acacia cyclops* (Rooikrans), *Acacia longifolia* (long-leaved Wattle), *Acacia melanoxylon* (Blackwood), *Acacia*

TABLE 1.—The numbers of species that have been used or recommended for use in South Africa for the different barrier categories

Barrier category	Total no. of species	No. of indigenous species	% indigenous species
Garden hedges	253	96	38
Windbreaks/ shelterbelts	215	32	15
Security hedges	65	36	55
Combined categories	428	134	38

pycnantha (Golden Wattle), *Acacia dealbata* (Silver Wattle), *Acacia mearnsii* (Black Wattle) and *Pinus pinaster* (Cluster Pine) which have been used as windbreaks and shelterbelts.

Other plants, now accepted as indigenous, may owe their introduction and spread to their use as stockade plants e.g. *Euphorbia tirucalli* (Wells, 1959).

The use of exotics is especially prevalent in towns and cities where people have little knowledge of the potentials of indigenous plants and rely on plants readily available from nurserymen. Nurserymen, in turn have mainly confined their attention to well-known (tried and tested) exotic species.

There are other reasons for exotics being favoured. Firstly, there is a great demand for fast-growing, frost-hardy species for the cold interior regions of South Africa. These areas are very poor in indigenous woody species and at present the only species available of proven performance are exotic. Also, there has been very little serious investigation into the propagation, cultivation and utilization of indigenous plants (apart from the most showy ornamentals) and, finally, the public has been led to believe that our indigenous species are inferior to exotics.

In rural areas where people are in closer contact with the indigenous flora and where security hedges are more in demand than decorative hedges, there is a greater appreciation and use of indigenous species.

The use of some indigenous species for barrier purposes dates back to the earliest recorded history of South Africa. In those early days most barriers were planted for security reasons. Either live plants were used or the severed branches of spiny trees and shrubs were placed round kraals and fields. *Acacia karroo*, the sweet-thorn, was used extensively to make kraals for stock and even today it is often used for this purpose. The wolwedorings of the genus *Lycium* owe their common name to the fact that they once made spiny barriers round kraals to keep out hyaenas ('wolwe' or 'wolves' to the colonists). The spike-thorn, *Maytenus heterophylla*, the Kei-apple, *Dovyalis caffra* and the Buffalo thorn, *Ziziphus mucronata* have similar uses.

Garden hedges

Seven of the eleven most popular (the most quoted in the literature) exotic garden hedge species have become naturalized in parts of South Africa (Table 2). Five of these species, like some of our worst invasive exotic plants produce berries which are dispered by birds, thus adding to the problem of control.

Windbreaks/shelterbelts

Seven of the nineteen most popular (the most quoted in the literature) exotic species have become naturalized in parts of South Africa (Table 3). *Rhus lancea* is one of the very few indigenous species that is popularly used as a windbreak.

TABLE 2.—Indigenous and exotic garden hedge plants used in South Africa: the species most quoted in the literature

Indigenous species	Exotic species
Tecomaria capensis (Cape Honeysuckle)	*Hakea saligna* (Willow Hakea)*
Dodonaea viscosa (Sand Olive)	*Cotoneaster pannosa* (Cotoneaster)*†
Portulacaria afra (Spekboom)	*Ligustrum lucidum* (Chinese Privet)*†
Carissa macrocarpa (Amatungulu)	*Pyracantha coccinea* (Red-Firethorn)*†
Dovyalis caffra (Kei-apple)	*Ligustrum ibota* (Small-leaved Privet)†
Rhus lancea (Karree)	*Pyracantha angustifolia* (Yellow-Firethorn)*†
Pittosporum viridiflorum (Cape Pittosporum)	*Pyracantha coccinea* var. *lalandii* (Orange-Fire-thorn)†
Rhamnus prinoides (Glossy-leaf Redwood)	*Duranta repens* (Forget-me-not-bush)*
Plumbago capensis (Plumbago)	*Eugenia eucalyptoides* (Mimi)
Duvernoia adhatodoides (Pistol bush)	*Leptospermum laevigatum* (Australian Myrtle)*
Euphorbia tirucalli (Rubber hedge Euphorbia)	*Thuja orientalis* (Chinese Arbor-Vitae)
Myrsine africana (Cape Myrtle)	
Halleria lucida (Tree Fuschia)	

* Species which have become naturalized in parts of South Africa
† Exotic species which have bird-distributed berries

TABLE 3.—Indigenous and exotic windbreak/shelterbelt plants used in South Africa: the species most quoted in the literature

Indigenous species	Exotic species
Rhus lancea (Karree)	*Pinus halepensis* (Aleppo Pine)*
Podocarpus henkelii (Henkel's Yellowwood)	*Cedrus deodara* (Deodar)
Carissa macrocarpa (Amatungulu)	*Callitris glauca* (White Callitris)
Harpephyllum caffrum (Wild Plum)	*Ceratonia siliqua* (Carob)
Olea africana (Wild Olive)	*Pinus radiata* (Monterey Pine)*
Acacia karroo (Sweet thorn)	*Pinus roxburghii* (Chir Pine)
Chrysanthemoides monilifera (Bushtick berry)	*Acacia baileyana* (Bailey's Wattle)*
Podocarpus falcatus (Outeniqua Yellowwood)	*Cupressus sempervirens* var. *stricta* (Churchyard Cypress)
Rhus leptodictya (Mountain Karree)	*Eucalyptus melliodora* (Yellow Box)
Trichilia emetica (Natal Mahogany)	*Quercus ilex* (Holm Oak)
Virgilia oroboides (Keurboom)	*Acacia decurrens* (Green Wattle)*
	Casuarina cunninghamiana (Beefwood)
	Chamaecyparis lawsoniana (Lawson's Cypress)
	Eucalyptus camaldulensis (Red River Gum)
	Eucalyptus cinerea (Florist's Gum)*
	Eucalyptus sideroxylon (Black Ironbark)
	Pinus patula (Patula Pine)*
	Populus nigra var. *italica* (Lombardy Poplar)
	Schinus molle (Pepper tree)*

* Species which have become naturalized in parts of South Africa.

Security hedges

In the course of field surveys the writer has added 160 indigenous species to the list of species from the literature. Many of these plants may prove to be of limited use but at this stage they have been included because they possess one or more favourable characteristics. One hundred species have been assessed for their suitabilities in each of the security hedge plant categories and have been placed in high, medium and low priority classes.

All the high priority species (given in Table 4) have been selected from the northern parts of South Africa where the climatic conditions range from cold (with moderate frost) and dry to hot (frost-free) and dry and hot (frost-free) and moist.

TABLE 4.—Important security hedge plants identified from the literature and field investigations

Framework species	
Carissa macrocarpa (Amatungulu)	*Acacia erubescens* (Blue thorn)
Dovyalis caffra (Kei-apple)	*Acacia mellifera* (Black thorn)
Euphorbia grandicornis (Big-horned Euphorbia)	*Rhus ciliata* (Suur Karree)
Phoenix reclinata (Wild date palm)	*Euphorbia cooperi* (Lesser Candelabra tree)
Entada spicata (Spiny splinter bean)	*Dichrostachys cinerea* (Sickle bush)
Acacia schweinfurthii (River climbing Acacia)	*Acacia senegal* var. *rostrata* (Three-thorned Acacia)
Acacia ataxacantha (Flame Acacia)	*Terminalia prunioides* (Purple-pod Terminalia)
Acacia kraussiana (Coast climbing Acacia)	
Acacia luederitzii var. *retinens* (Bastard umbrella thorn)	
Short fillers	**Tall fillers**
Carissa bispinosa var. *bispinosa* (Num-Num)	*Balanites maughamii* (Torchwood)
Acacia hebeclada ssp. hebeclada (Candle-pod Acacia)	*Acacia senegal* var. *leiorachis* (Three-thorned Acacia)
Maytenus polyacantha (Kraal Spikethorn)	*Acacia nigrescens* (Knob-thorn)
Commiphora pyracanthoides (Common Commiphora)	
Entanglers	
Scutia myrtina (Cat-thorn)	*Asparagus racemosus* (Katbos)
Capparis sepiaria (Wild Caper bush)	*Asparagus saundersiae*
Capparis fascicularis	*Asparagus laricinus* (Katbos)
Smilax kraussiana	*Asparagus krebsianus*

Carissa macrocarpa and *Dovyalis caffra* are common hedge plants in South Africa. They are both extremely dense, spiny and sturdy. *D. caffra* is cultivated as a hedge and for its fruits as far afield as Australia, California and the Mediterranean countries.

The succulent Euphorbias have great potential as security barrier plants. Some species very closely resemble the 'ideal' framework species, being sturdy, drought resistant, armed with spines and having a milky latex which is toxic. In some species the latex is so toxic that it would serve as an immediate deterrent to any intruder. There is no other plant or group of plants either indigenous or exotic in South Africa that combines such formidable features. Disadvantages are that they are not fire-resistant, that they are difficult to handle, and that they are slow-growing. The latter disadvantage can be offset in some species by planting them as well-grown truncheons.

CONCLUSIONS

An analysis of the literature has confirmed that many exotic barrier plants are invasive and there is therefore a need for indigenous species to supplement and replace them. Initial field work has resulted in the identification of many potentially useful barrier plant species whose usefulness needs to be put to the test in a range of situations.

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