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Mesquite (Prosopis juliflora D.C.)

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The Mesquite undoubtedly provides shade and produces nutritious pods under conditions where few other trees will grow. It can, however, have drastic effects on other vegetation. In the Southern United States it has caused a considerable reduction in the carrying capacity of millions of acres of range lands and in Western Australia large tracts of grazing country could be affected.
A TREE grown for shade and ornamental purposes and bearing nutritious pods would appear to be welcome anywhere. This description applies to Mesquite; however, it has certain undesirable characteristics which usually outweigh the advantages and pose a major agricultural problem. That, in fact, is the position in Western Australia.

United States
The most extensive areas of Mesquite occur in the United States, where it is firmly established over 70 million acres of range in Texas, New Mexico and Arizona. It is native to this territory but remained in a state of balance with the other vegetation until the introduction of domestic livestock. At least half the area has been invaded since the grazing of animals was started and the change has occurred during the last 100 years.

Before its encroachment on grassland ranges, the plant was confined to the valley bottoms and drainage courses, with the uplands being dominated by grasses. Now much of the upland has shrubby vegetation with a big proportion of Mesquite.

Balance of Species
The rapid spread in America has been the subject of much research costing many thousands of dollars. No doubt a number of factors have contributed to disturbing the previous delicate balance between grassland and woody species.

Those suggested include natural biotic factors such as:
- Insects causing a reduced seed crop.
- Cessation of recurrent prairie fires.
- Drought.
- Grazing by domestic animals.

Besides the effects of selective grazing, animals undoubtedly cause widespread distribution of seeds.

Introduction
Seeds of Mesquite have been introduced to many countries but in most cases little more has been heard of the plant.

Two exceptions, however, are Hawaii and Western Australia.

It is recorded that Father Bachelet planted seeds of Algaroba or Mesquite near the Catholic Cathedral at Honolulu in 1828. The one seedling that appeared grew rapidly into a large tree and the seeds were carried by cattle to the barren hillsides of extinct craters, and also to elevated coral beds.

The plants thrived and soon the accidental distribution was supplemented by systematic plantings from which thousands of tons of pods for cattle food were obtained.

In comparing Hawaiian experience with that of other countries, several aspects must be kept in mind. Much of the land had previously carried little or no herbage; cheap labour is available for gathering the pods, and the species or variety of Mesquite grown may not be the pest type of other lands.
Western Australia

Seeds of Mesquite were introduced to Western Australia about 30 years ago, although probably there had been introductions before that time. The seeds, reputedly those of a spineless type, were planted in a number of towns in the North-West and on many station properties, mostly with a view to providing shade and shelter. Pastoralists also grew them for the nutritious pods.

Often the plants were difficult to raise but they were established in a number of localities. It was found that although some of the trees were innocuous, or had only small spines, others were heavily armed with thorns more than three inches long.

Spread

The plants showed little tendency to spread at first and remained restricted to the favourable conditions around mills, in gullies and in the vicinity of homesteads where some watering was carried out.

The first major spread followed the wet season of 1945 when, as with the American pattern, plants appeared on relatively high ground some distance from waterways. In following dry seasons the spread was restricted, but the plants showed no tendency to recede and spread further in favourable seasons.
The same section of Mardie Station shown in the picture opposite. The photograph was taken in 1961 after the Mesquite had been eliminated by the methods described in this article.

By 1954 on Mardie Station, Mesquite was spread over more than 30 square miles. About four square miles of this had reached thicket formation. The infestation originated from a few trees at the homestead and some plantings at mills. During this time plants had also spread naturally for several miles from where they had been planted in towns and a number of thickets had been formed.

This explosive type of distribution, after periods of quiescence is a dangerous characteristic.

Summer Rainfall

Mesquite is only likely to become aggressive where there is summer rainfall. It has been introduced to other States but, so far, has not shown the strong weed tendencies that it has displayed in Western Australia. Authorities in other parts of Australia, however, are aware of the experience in W.A. and are not taking liberties with this plant.

DESCRIPTION

The Mesquite is a legume belonging to the same group as the wattles. The names Mesquite and Algaroba are both given to two or more species of *Prosopis* which intergrade into each other almost completely. American workers consider most Mesquites to be one species, *P. juliflora*, but recognise three varieties:—
Each of the pods contains 10 to 20 seeds. These seeds are not readily digested and consequently are widely distributed in cattle droppings.

- **Honey Mesquite**—*var. glandulosa* (Torr.).
- **Cockerill**, the common variety found in Texas.
- **Western Honey Mesquite**, *var. Torreyana* L. Benson, common in southern New Mexico, western Texas and south-eastern Arizona.
- **Velvet Mesquite** *var. velutina* (Woot.) Sarg. which occurs in Arizona.

The main distinguishing features of these varieties are the size, shape and hairiness of the leaflets. These range from the short, hairy and closely-spaced leaflets of Velvet Mesquite to the long, linear, glabrous and widely spaced leaflets of Honey Mesquite. Western Honey Mesquite is intermediate between these.

**Character of Growth**

Depending on climate and soil, all three varieties of Mesquite vary in character of growth, being either trees or shrubs. In favourable conditions they may become large trees of 40 feet or more in height with defined trunks two feet or more in diameter. In semi-arid sandy places, Mesquite is a many-stemmed shrub about three feet high. The type that causes most concern is intermediate, often being branched from the base and reaching a height of 15 to 20 feet.

The leaves, which are dark green and divided into numerous small leaflets, are similar to those of some Acacias, particularly *Acacia Farnesiana* with which Mesquite is sometimes confused. In America the plant is deciduous but in the north of this State it is evergreen. The wood is hard and a reddish brown with an outside layer of yellow sapwood. The twigs are armed with straight spines which vary in size but may reach a length of three to four inches, usually being more numerous and better developed on regrowth from stumps. The small, greenish-yellow fragrant flowers are borne near the ends of the branches in cylindrical clusters two to three inches long.

The fleshy pods or beans are straw-coloured when ripe. They are four to eight inches long and each contains 10 to 20 hard seeds.

*Mesquite has been declared a primary noxious weed for that portion of the State north of the 26th degree of latitude. It is compulsory to destroy the plant in that area.*

**SIGNIFICANCE**

As already mentioned, Mesquite has some desirable features. The timber has been used in America for both fuel and posts, although in recent years the value for these purposes has declined. The pods contain a high proportion of sugar and protein and are relished by stock. In Hawaii many thousands of tons are gathered annually and ground into meal for livestock. Although the foliage is often sparse it has been used for shade and shelter where more umbrageous trees will not grow, and apiculturists regard it as a valuable source of honey.

*Why are we concerned about the spread of a plant that has all these attributes?*

Kenneth W. Parker and S. Clark Martin in their publication—“Mesquite Problems on Southern Arizona Ranges” list these principal reasons:
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Mesquite, even under moderate grazing is still persistently increasing both by invading open grassland and by thickening of old stands.

Cutting Mesquite, especially in bottom-land areas usually results in an impenetrable thicket of sprout regrowth and new seedlings. In many of these "jungles," grazing has had to be abandoned.

Livestock handling costs are increased, especially in dense upland Mesquite thickets where it is difficult to gather livestock for market, or to find screw-worm-infested animals for treatment.

Increases in Mesquite are usually accompanied by a fall in quantity and quality of perennial grass forage and corresponding reductions in livestock production.

Still more serious from a long term viewpoint is the accelerated erosion generally found on uplands as well as bottom lands wherever Mesquite has encroached.

To these must be added severe digestive troubles resulting from impaction where range cattle are forced to subsist chiefly on Mesquite beans and leaves.

American experience is being largely repeated where Mesquite has become established in Western Australia. Dense thickets have interfered with the mustering of stock and prolific growth near windmills has acted as a shield preventing the pumping of water. Thorns have injured the hooves of animals, and have also punctured many vehicle tyres.

Besides supplanting mulgas and other valuable forage shrubs, the surface roots of the Mesquite compete strongly with grasses which soon disappear from around the trees. Mesquite is therefore an enemy of the most valuable assets of our pastoral country and can cause a rapid deterioration in grazing value. Undoubtedly this menace, if allowed to progress, could impair the productivity of millions of acres in the northern parts of the State, as it has already done in the southern parts of the United States.

Shade Trees

Mesquite is one of the few trees that townspeople have been able to establish for shade and shelter under the hot, dry conditions of the North-West. It is understandable that those who do not appreciate its significance to the pastoral industry are loth to destroy it. Several other trees without the undesirable characteristics of the Mesquite have been grown however, including the athel tamarisk (Tamarix aphylla), kurrajong (Brachychiton spp.), river gum (Eucalyptus camaldulensis) and various palms. The athel tamarisk can be propagated from cuttings, grows rapidly and provides good shelter from wind.

CONTROL

Mesquite will develop roots from stems if they happen to be covered by drifting sand but distribution is mainly by seeds.

Hard Seed

Seed production is variable, but even in seasons of sparse seeding some plants may produce a heavy crop of pods. In common with many other legumes hard seeds are formed which do not absorb water readily and may remain dormant for a number of years. Seeds have been found viable after storage for 44 years in the herbarium. Such longevity is a great advantage for ensuring reproduction in areas with unreliable seasons.

Extensive Rooting

Mesquite has an extensive rooting system with a taproot and strongly-developed
surface roots. Initially the taproot outgrows the shoot and when the plant is a foot high the taproot may be considerably longer. This penetration by the root is a characteristic of many drought resisting plants, enabling moisture to be obtained when the soil nearer to the surface is dry. At the base of the stem where it joins the main root, is a dormant bud zone often extending six to eight inches below ground level. If the upper portion of the plant is removed or severely damaged, these buds become active and produce a number of rapidly growing shoots. There is similar reaction if the roots are disturbed but only partially removed from the ground. Any control measures, particularly mechanical methods, must therefore be systematic and thorough to be effective.

Spread by Stock

The seeds of Mesquite are carried by flood waters but stock have been responsible for much of the spread. Some of the seeds pass through the animals without

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being digested; in fact this may stimulate germination. Seedlings often appear in cow pats—a healthy environment for young plants—and there is some evidence that they are transported by kangaroos. Some wild animals in America are also responsible but not to the same extent as cattle.

If only a few trees occur, as is usually the case when planted in the garden, they can be destroyed by grubbing below the bud zone.

**Chemical Control**

The possibilities of chemical control were investigated at an early stage. Spraying the foliage and stems with 2,4,5-T was first tried but did not prove satisfactory except in the case of young plants. Besides being more difficult to kill, the larger trees took longer to treat and required more chemical. This method would not be practicable for large areas, although, seedlings are being controlled by spraying with three pounds acid equivalent of 2,4,5-T in 100 gallons of water.

Further investigations showed that even large trees could be killed by spraying or jetting the lower two or three feet of the trunk with diesolene containing one pound acid equivalent of 2,4,5-T ester in 10 gallons.

Care must be taken that the trunk is completely encircled and the bark thoroughly covered. A knapsack spray pump is suitable for this treatment and should be operated at a low pressure so that a fine stream of liquid rather than a spray is ejected.

Although the treatments suggested are practicable for small groups of trees, or even a greater number scattered over a wide area, they do not solve the problem of extensive, continuous infestations.

**Aerial Spraying**

Encouraging reports were received from America following the application of 2,4,5-T by means of aircraft but at the same time reference was made to the variability of the results which, in some cases were poor.

As an effective aerial treatment would have been of major assistance in handling the most serious infestation in Western Australia, a trial was undertaken using 14, 22 and 28 ounces acid equivalent of 2,4,5-T in four gallons of 25 per cent. diesolene-water emulsion per acre. In each case complete defoliation occurred within a few weeks, but later new shoots appeared and only a small proportion of the Mesquite was killed. These were mainly smaller plants in the more scattered formation.

**Two Sprayings**

To obtain deeper penetration and greater uptake of the chemical from two spaced sprayings, an application of 12 ounces acid equivalent of 2,4,5-T in four gallons of 25 per cent. diesolene-water emulsion per acre was made on August 23, 1954. This treatment again caused the plants to lose their leaves and when they had partially recovered a further application, at the same rate, was made on November 13, 1954. The final result was better than with the single spraying but was not good enough to warrant persevering with the method.

**Mechanical Control**

Chemicals did not appear to give the answer for the control of the extensive thicket formations. In 1956 consideration was given to mechanical methods. Experience in the United States had already underlined the suckering problem associated with these methods.

The first problem was the lack of suitable equipment in the heavily infested area. However, satisfactory arrangements were finally made with a contractor to undertake the work.
The Operations

Three operations were involved:—Chaining to drag out as many of the trees as possible; bulldozing to handle some larger trees and lift stumps from the ground, and raking into windrows.

Two powerful crawler tractors were used to drag a chain 220 feet long and weighing more than five tons. The worst affected area totalling 1,000 acres was chained twice from different directions and a high proportion of the Mesquites were removed completely from the soil. Any remaining plants were lifted with the tractor blade. A four ton scrub rake was then used to drag the debris into windrows.

At the start it was thought that some ploughing would be necessary to remove roots and break the ground to stimulate ground cover. After operating the heavy scrub rake, however, this was unnecessary.

Recovery of Herbage

A further 230 acres were double chained without raking and 720 acres of more scattered growth was chained once only. Almost 2,000 acres were traversed and the operations completely changed the landscape in the vicinity of the Mardie Homestead. The work was completed by the middle of April, 1956, and when a further visit was made in August there had been a spectacular recovery of useful herbage on the cleared area, with buffel grass predominating.

Controlling Regrowth

The extent of regrowth from suckers was less than expected and these, along with seedlings, have been controlled mainly by basal treatment with 2,4,5-T. Eight men using knapsack sprays and spaced over a distance of 200 to 300 yards can treat about 100 acres a day. It is tedious work, but the effort is certainly justified; what appeared to be a hopeless task a few years ago is now being tackled with confidence.

Good Progress in Control

Mardie Station and other infestations of Mesquite between Carnarvon and Derby were inspected during a recent tour of the northern parts of the State. Besides the spectacular progress made at Mardie there is a marked reduction in the number of trees on other stations and at coastal towns. A pleasing feature is the manner in which the local authorities, pastoralists and town residents are now co-operating in the campaign.
CONCLUSION

Reference has been made to the fact that although Mesquite was introduced to many countries from its natural habitat in the southern United States, only in two places, Hawaii and Western Australia, has its presence caused more than casual interest. Having visited Arizona, New Mexico and Hawaii not long before the inspection of infested areas in the North-West, it is possible to review the local problem in relation to experiences elsewhere.

In the United States:

In Arizona, Texas and New Mexico, Mesquite continues to be a menace. Extensive research is still being undertaken but the original hopes for aerial spraying are not being fulfilled. Some excellent kills have been obtained, but more often, with no obvious differences in conditions, results have been poor. Chemical and management studies are continuing at the Santa Rita Experimental Station near Tucson in Arizona. These include studies of grazing losses related to Mesquite population in an attempt to decide the economics of partial control by periodical aerial spraying.

In Hawaii:

It can be understood why Mesquite is tolerated, in fact encouraged, in Hawaii. The trees grow on the slopes of craters and other unproductive land and with cheap labour available there is no problem in harvesting the nutritious pods for stock forage. The climatic conditions and system of agriculture are different from those places where the plant is a pest.

In Western Australia:

In Western Australia Mesquite covers thousands of acres compared with millions of acres in the United States. Our present problem, by no means small, could develop into a national one comparable with the prickly pear if allowed to develop. Large areas of the more productive land in the North-West are potential areas for Mesquite and carrying capacity could be considerably reduced within a few years. We cannot afford to be passive with such an insidious migrant.
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