

The Problem of the Lantana.

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IT seems almost incredible that a small ornamental hedge shrub introduced into India about a century ago should have developed into pest proportions and overrun millions of acres of cultivable land and forest areas in almost every province of this country! Yet such is indeed the case: the menace of the lantana is one of the most serious problems of India to-day and unless a quick and cheap method of controlling its spread is soon discovered, the rapid invasion of this naturalized exotic will do incalculable harm to the preservation and progress of agriculture and forestry in the country.

Lantana Camara Linn (Syn. *L. aculeata* Linn) belongs to the natural order, *Verbenaceae* and would appear to have been originally introduced into this country from Mexico. It is a thorny shrub with re-curved prickles on the stems and branches, leaves possessing a strong and pleasant odour and flowers varying in colour from yellow to crimson. The fruits, which are formed in large numbers practically all round the year, resemble black drupes and are readily consumed by birds and animals, which disseminate the seeds through their droppings. Under favourable conditions the shrub forms a dense, impenetrable growth often reaching a height of over ten feet, the thorny branches forming a network resulting in a closed canopy. The plant flourishes under varying soil and climatic conditions, in regions of high and low rainfall (200—30 inches per annum), in rich as well as poor soil and in low-lying regions as well as on hill slopes upto a height of about 4,500 ft. above sea-level. Its growth is most intense among the uncultivated lands and scrub-type jungles of the Deccan plateau, parts of the Vindhya, Chota Nagpur and Assam, while in the deltaic regions, particularly those on the East Coast, it is either sparsely distributed or does not occur at all.

The lantana is, normally, a light-loving plant but it can also grow under moderate shade. It withstands drought, is highly tenacious of life and regenerates quickly after being cut, trampled or burnt by fire. The plant burns readily even in the green thus facilitating the spread of forest fires and consequent destruction of more valuable

species. After the fire the lantana is the first to recover; it comes up with a denser growth than ever before and thus smothers out other species that may regenerate more tardily. It propagates readily from stumps or cuttings but in the field or jungle the regeneration is generally from seeds.

During recent years the spread of lantana has been enormous and rapid. About 50 years ago, the shrub was found in isolated patches in uncultivated and fallow lands but now it has spread throughout India and Burma, particularly in the Deccan plateau, where it encroaches even on cultivated lands with the result that its eradication has now become one of the most important and immediate problems of the farmer. Unfortunately no systematic record of the spread of lantana in different parts of the country is available but the following data relating to four forest ranges in North Salem, Madras Presidency, would illustrate the position:—

Range	Area under lantana in acres during the		Spread interval
	1917	1931	
Dharmapuri	Nil	20,844	20,844
Anchetti	45	37,524	37,479
Denkanikota West	1,472	45,806	44,334
Denkanikota East	2,005	35,090	33,085

In the district under reference the area under lantana has increased from about 3 to 42 per cent of the total forest lands within a short period of fourteen years. Judging from the present rate it is not improbable that almost the entire area of not only North Salem but also the remaining part of the Deccan plateau will soon be overrun by this highly aggressive shrub.

Further instances of the dangers arising from the spread of lantana are not wanting. Culturable wastes and fallow lands are rendered unworkable: the soil is depleted of its nutrition and subsequent crops almost invariably fail. The erstwhile grazing grounds are now covered up with lantana which, in addition to suppressing the growth of grass, also prevents the cattle and sheep from gaining access to the little that may be enclosed within. In the deciduous type of forests lantana is chiefly responsible for periodical outbursts of forest fire while in the semi-evergreens it is steadily ousting the

more valuable species, causing degeneration from the original climax type. Lantana is a bad host for sandal because it fails the latter in seasons of drought and subjects it to excessive shade in others. Judging from the high incidence of sandal spike in lantana areas, the shrub would appear to be, in some way, connected with the spread of that dreaded disease. In many parts of the country lantana is found to harbour injurious insects including malarial mosquitoes so that it becomes a source of danger to other plant life and a menace to public health.

The existence of lantana is not, however, an unmixed evil: it has also got some valuable properties which have either not been fully understood or adequately utilized. In addition to making an ornamental hedge plant, its ability to thrive on some of the poorest soils like gravel or hard laterite facilitates the opening up of areas which are inhospitable to most other plant species and which would otherwise become rocky and barren. The plant itself contains several valuable ingredients, some of which are being utilized while the others are still awaiting proper application. The leaves and flowers contain essential oils which were studied by Kanga (*Jour. Indian Inst. Sci.*, 1, 93, 1914-18) and later by Moudgil and his co-workers (*Perf. and Ess. Oil Rec.*, 13, 173, 1922; *ibid.*, 16, 9, 1925). The oils are yellow in colour with pleasant and somewhat powerful odour: they are being distilled by some firms but their uses would still appear to be obscure. Edel Behram investigated the possibility of using the leaves as substitutes for tea. He detected the presence of a large number of enzymes including a powerful oxidase corresponding to that present in tea. He fermented the leaves and obtained a product which though resembling tea in appearance did not yield a beverage of the same quality (*Jour. Indian Inst. Sci.*, 2, 195, 1918-20). The above study was essentially a preliminary one and requires repetition under standard factory conditions. De, Ganesh Rao and others have shown that the composition of different parts of the lantana plant, particularly the leaves, would point to their being suitable for the manufacture of synthetic organic manures (*Agri. Jour. India*, 25, 143, 1930): the more recent observations of Subrahmanyam and Jagannatha Rao show that composts prepared out of lantana contain a fairly high percentage of phosphoric acid, a constituent which is sadly wanting in most

Indian soils (*Jour. Indian Inst. Sci.*, 15A, 89, 1932). The possibility of using the twigs for the generation of heat and power, the manufacture of mineral fertilizers from the residual ash, the products of destructive distillation of the whole or different parts, the application of the residual charcoal for adsorptive or clarifying operations in arts and manufacture, the disinfective and insecticidal properties of the oils and related preparations, the uses of the variegated pigments present in abundance in the flowers—these and related problems are still awaiting solution.

Although the aggressive and pestilential nature of lantana would provide a strong argument for its eradication, yet the few good qualities which it is known to possess and the inadequacy of our knowledge regarding the others would justify its retention provided it does not endanger the life of other valuable plant species in the forest or on the field. The problem would, therefore, resolve itself into one of controlling the distribution and spread of lantana.

In recent years, several attempts have been made, particularly in South India, to check the spread of lantana but, unfortunately, without much success. The problem engaged the attention of the Coorg Government as early as 1912. Tireman drew pertinent attention to the evil effects of lantana on other forest species, particularly sandal, and proposed an elaborate scheme for its elimination from that province. His method consisted in stumping the plants in February or March and removing the cut material away from the stumps and burning it. The stumps were to be subsequently pulled out in the rainy season when the ground is soft. Frequent uprootal in the above-mentioned manner for at least four years were considered necessary to ensure the success of this mechanical operation (*Indian Forester*, 42, 385, 1916). Tireman's scheme involved the clearing up of 63,000 acres in the course of 12 years at a total cost of 4½ lakhs of rupees, but unfortunately it was not adopted. A special legislation known as "The Coorg Noxious Weeds Regulation" was introduced in 1914, but no action seems to have been taken to prevent the natural spread of lantana.

Insect control of lantana is claimed to have been successful in the Hawaii islands where the agromyzid fly feeds on the immature seeds and thus prevents the

regeneration of the plant. With a view to determining whether similar methods of biological control would be possible in India, the Government deputed Rao Bahadur Y. Ramachandra Rao in 1916 to study the insect relations of lantana and to suggest means of checking its spread. The results of the investigations are embodied in a long and useful report (*Dept. Agri. India, Memoirs Ent. Series, 5, No. 6, 1920*) wherein the author has listed the various species of insects visiting lantana. No evidence could, however, be found to suggest that any of the indigenous species is capable of keeping the shrub sufficiently under check. The author suggested, therefore, that the foreign fly should be imported into India. The proposal did not, however, meet with general approval: in the preface to the Memoir under reference, Mr. Bainbridge Fletcher, the Imperial Entomologist, viewed with apprehension the possibility of the agromyzid fly proving a menace to the other members of the order *Verbenaceae* and, in particular, to teak (*Tectona grandis*) in which case the loss will be irreparable. Some attempts were still made to introduce the agromyzid fly into India. Dr. Kunhi Kannan obtained a few insects with great difficulty and released them in Bangalore: but though he was satisfied that the insects did no harm to teak, he could not yet get them to 'catch' on lantana with the result that they all escaped and could not be subsequently traced, despite careful search! (*Agri. J. India, 19, 504, 1924*.) Even in Hawaii the agromyzid fly has no very marked effect on lantana: the area under that shrub has always remained small so that it is difficult to define the possible efficacy of introducing the insect into India on a large scale. The insect would not appear to be as specific in its action on lantana as is the cochineal insect on prickly pear so that the possibility of effectively controlling the spread of lantana by the introduction of that seed fly would appear to be rather remote.

Cultural control of lantana is a promising line of enquiry, but no systematic attempt in this direction has so far been made. There is evidence to show that certain soil conditions as also the floristic make up of certain regions are highly effective in checking the spread of lantana. Even in areas like North Salem where lantana abounds there are numerous little patches where the shrub either makes poor growth or does not

appear at all. In certain localities where the soil contains a high percentage of kaolin or certain other light, silicious earths, lantana is generally absent while other species flourish. It has already been stated that lantana does not thrive under dense cover and that heavy foliated species of the high forest type generally keep out the incursion of this shrub. As an instance of this it may be mentioned that in the Siddapuram R.F., in North Salem, lantana does not grow under the heavy shade of the evergreen shola species and even in places where it has gained entrance the shrub invariably exhibits a weak growth. It is true that the introduction of *Ficus elastica* or castor did not prevent the spread of lantana in certain parts of Madras, but further systematic study might reveal the presence of more powerful species that would not only check the spread of lantana but would also help to eliminate it from other areas.

The use of chemicals for the eradication of undesirable plants is well known and is extensively adopted in America. There are a number of cheap inorganic and organic chemicals which are deadly in their action on all forms of plant-life: there are others which are selective or specific in their action. It is not improbable that a judicious application of one or both of the above types of compounds would be helpful in either keeping down lantana or eliminating it altogether. To be efficacious, the chemical must be easy of application and possess high penetrative power reaching the farthestmost ends of the plant; it must be highly toxic even at low concentrations and effective irrespective of season. A thorough knowledge of the physiology of the plant is also essential to gain an insight into the nature of its response to various treatments. An investigation into the above and related aspects of the problem has been undertaken by the author in co-operation with the Madras Forest Department. Various observations of interest have already been made both in the laboratory and on the field among which particular mention may be made of the fact that chlorates and arsenicals are highly effective in killing lantana. A study of the various methods of application is also under way.

Much more yet remains to be done. The extent of spread of lantana in different provinces, the rate and manner of its progress, its effect on other forms of vegetation and its relation to plant pests and carriers of human disease require investigation

in detail. The precise nature of the soil conditions that check the spread of lantana has yet to be ascertained. A systematic survey of the ecology of that shrub has to be made in different parts of the country, particular attention being paid to areas where other forms of vegetations have steadily dominated over lantana, so that the observations with regard to the flora as well as the fauna of such localities may provide the necessary clues to similar control in other places as well. The introduction of the foreign fly does not appear to be a promising line of attack, but in view of the incomplete evidence provided by the previous work, some further trials may be carried out with that insect. In the laboratory a great deal of systematic work is still awaiting to be investigated. Some useful beginnings have no doubt been made at the Indian Institute of Science, but more intensive work has still to be carried out, particularly with regard to the conversion of the different parts of the shrub into synthetic organic manure for use in areas where other forms of vegetation are scarce.

Attention should also be paid to the economic combustion of the plant for generation of energy, the utilization of the different products of distillation in arts and manufacture, and the exploitation of the ferments, oils and other constituents already known to be present in the plant. The observations on chemical control have to be repeated in various provinces and in different seasons and the conditions standardized for extended adoption of the technique. The above and related problems are of considerable practical importance and it is earnestly hoped that they will soon engage the attention of the Imperial Council of Agricultural Research, the Forest Departments of the different provinces and the scientific laboratories in different parts of the country.

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