

Indian Plants of Entomological Interest in Hawaii¹

T. NISHIDA²

HAWAII AGRICULTURAL EXPERIMENT STATION
UNIVERSITY OF HAWAII
HONOLULU, HAWAII

(Submitted for publication November, 1960)

Some of the features of India that impress a foreigner are the great ranges of rainfall, temperature, and topographic features. These variations are manifested in the great diversity of vegetation. It has been stated that India, with its 2,500 species of indigenous trees, has the most diverse natural vegetation in the world (Chatterjee, 1953). During my ten-month sojourn there, it was indeed surprising to find in India many plants found in Hawaii. The purpose of this paper is to present an annotated list of plants common to both Hawaii and India which are of interest entomologically. Included in the list are plants that are of interest to entomologists in Hawaii because (1) they are noxious weeds which entomologists are interested in controlling biologically and (2) they are infested by insects which do not occur in Hawaii, and thus might be of interest to economic entomologists and quarantine officials.

NOXIOUS WEEDS

Pamakani, *Eupatorium adenophorum* Spreng.

Pamakani, a native of Mexico, is a serious pest of the range lands in Hawaii (Hosaka and Thistle, 1954). A tephritid gall fly, *Procecidochares utilis* Stone, introduced from Mexico, has been found to be an effective agent in controlling this weed (Bess and Haramoto, 1956).

During October, 1959, I found pamakani in Darjeeling at an elevation of 6,500 feet in the high mountainous region of northeastern India. The plants were growing on steep slopes as an under-story of coniferous trees in the vicinity of the Darjeeling Institute of Mountaineering and the Mount Everest Hotel. Probably because of the shaded conditions, the plants did not look as vigorous as those on the sunny slopes of Haleakala, Maui. A considerable amount of time was spent looking for insects associated with pamakani, but none were found.

Three days were spent during March, 1960, at Ootacamund, a hill station in south India at an elevation of about 7,000 feet, making observations on the

¹ Published with the approval of the Director of the Hawaii Agricultural Experiment Station as Miscellaneous Paper No. 129.

² These observations were made during a tenure of a research grant from the United States Educational Foundation. The encouragement and assistance in many ways of Dr. Olive Reddick, Director, U.S. Educational Foundation in India, are gratefully acknowledged. The helpful criticisms on the manuscript by Edward Hosaka, Specialist in Pasture Management and Agronomy, University of Hawaii, are also gratefully acknowledged.

distribution of pamakani. This plant was found along the dry stream beds under *Eucalyptus* trees not far from the Ooty race course. An examination of the plants, which were in full bloom at that time of the year, failed to reveal the presence of any phytophagous insects. As in Darjeeling, the pamakani at this hill station was not as vigorous as that in Hawaii.

Pamakani in India does not appear to be a serious weed pest. Field observations indicated that this plant does not have the vigor that it has in Hawaii, and, even without phytophagous insects to retard its growth, it does not appear to be spreading rapidly at present.

Lantana, *Lantana camara* L.

Lantana, a native of tropical America (Neal, 1948), is another serious weed pest of the range lands in Hawaii (Hosaka and Thistle, 1954). The potential menace of this plant to the Hawaiian cattle ranges was early recognized and insects to control it were imported as early as 1902. Insects to control this weed are still being introduced by the State Department of Agriculture and Conservation (Weber, 1956; Davis, 1958, 1959, 1960).

According to Dr. R. K. Tandon, Agronomist and Principal of the Government Agricultural College, Kanpur, India, lantana was imported into India only recently as an ornamental plant. In India it is doing very well as an ornamental, but in many places it has escaped cultivation and is becoming a serious pest. Lantana was observed growing very vigorously in the humid Himalayan foothills, Nilgiris hills in south India, and throughout the Gangetic plains. Besides man, the plant is no doubt disseminated by Indian mynah birds and others that feed on the seeds. In many parts of India the plant is growing vigorously and there is no evidence of insect defoliation and galling which are commonly seen on lantana in Hawaii.

Gorse, *Ulex europaeus* L.

Gorse is a leguminous plant, native of Europe (Hosaka and Ripperton, 1944). According to these authors this weed occurs on the range lands of Olinda, Maui, and Humuula, Hawaii. Attempts are being made by the State Board of Agriculture and Conservation to control gorse by introducing from foreign countries insects that feed on it (Davis, 1959).

In India gorse was observed widely spread in the hill station areas of Ootacamund at an elevation of about 7,000 feet. Tall, vigorous plants were found in abundance throughout this area and in many places valuable range lands were completely covered by it. In several places farmers were seen cutting and burning the plants. The only insect observed attacking gorse was the cottony cushion scale, *Icerya purchasi* Maskell, which was present in small numbers.

Crotalaria, *Crotalaria* sp.

It was not possible to obtain the specific name of this legume and hence it is not known whether this plant occurs in Hawaii. The genus *Crotalaria* is represented by several species in Hawaii, and, at least one of the, *C. longirostrata*, is

unpalatable to cattle and may be considered a pest of the range lands (Hosaka and Ripperton, 1944).

Crotalaria appeared to be a pest of the range lands in the hill station areas of Ootacamund. Tall, vigorous plants were commonly observed growing in association with gorse. Being unpalatable, both *Crotalaria* and gorse were virtually untouched by cattle while the surrounding species were eaten to the ground. Aside from the flower-visiting insects, no others were observed.

Prickly Pear, *Opuntia* sp.

The prickly pear, *Opuntia megacantha* Salm-Dyck, a native of Mexico, was introduced into Hawaii about 1800 (Neal, 1948). Although there is disagreement among ranchers as to the forage value of this plant, it is generally considered a pest because it crowds out the more desirable forage species (Hosaka and Thistle, 1954). Several species of insects, such as the *Cactoblastis cactorum* (Berg), and *Dactylopius opuntiae* (Cockerell), have been introduced in attempts to control the prickly pear in Hawaii (Weber, 1951).

In India the prickly pear, called "Nag-phunee" in the Bengali dialect, occurs in many places, especially in the dry regions of the Deccan plateau. Evidently the fruits are used as food for those of the red-fruited variety were seen on the fruit stands. The prickly pear was examined in only a few places in south India. Although it has been reported that the introduced cochineal insect, *Dactylopius* sp., was destroying the prickly pear in India, I saw no evidence of such destruction.

Algaroba, *Prosopis chilensis* (Mol.) Stuntz

The algaroba, a native of tropical America, is both a beneficial plant as well as a pest of the range lands (Hosaka and Thistle, 1954). From an entomological standpoint the algaroba is of interest because it is one of the major sources of honey in Hawaii. Recently, a moth, *Ithome concolorella* (Chambers), was found to damage the flowers of the algaroba (Clagg, 1954; Fullaway, 1954; Namba, 1956). Efforts were made to control this moth biologically, and a parasite, *Bracon gelechiae* Ashmead, was introduced from Arizona (Weber, 1956). There is no evidence that this parasite became established in Hawaii.

A plant very similar in appearance to the one called *Prosopis chilensis* in Hawaii, which is referred to as *P. juliflora* in India, was observed in the vicinity of Delhi, Agra, and Kanpur, India. The trees in these areas flowered in great profusion and produced as many as ten pods per raceme. The flowers were examined in Kanpur, but there was no evidence of any insect damage.

Guava, *Psidium guajava* L.

The guava, a native of tropical America, was introduced into Hawaii by Don Marin (Neal, 1948). In Hawaii it is a useful plant as well as a pest of range lands. However, in India, aside from the wild varieties growing in the hills of the southern region, much of the guava is cultivated. Large amounts of fruit are sold in the markets during the winter season when fruits of the best quality are produced. Although the guava is cultivated to a considerable extent in the

Indo-Gangetic plains, it has not escaped cultivation as it has done in Hawaii. Aside from fruit flies, no other major pest was found associated with it.

CULTIVATED PLANTS

Mango, *Mangifera indica* L.

The mango, a native of India, is grown in Hawaii both in the backyards and to a certain extent in commercial orchards. Fortunately, except for fruit flies, the mango tree in Hawaii is relatively free from pests. In India, where there are at least 400 varieties of mango, there are several serious pests which do not occur in Hawaii.

One of the most serious problems of mangoes in north India is the "malformation disease." This disease is characterized by the deformation of the terminal shoots and the inflorescence (Figure 1, top). The damage to the inflorescence is most serious because no fruits are produced on deformed panicles. Apparently, this disease is related to mites (Singh, 1955), but the etiological relationship between this abnormality and mites has not been clearly established.

The giant mango mealy bug, *Drosicha mangiferae* Green, is a pest of mango in north India. This mealy bug has been reported to affect adversely the fruit set when the inflorescence is attacked. During April, 1960, there was a severe outbreak of this pest at Kanpur. In the mango orchards located on the campus of the Government Agricultural College, the ground, trunks, and branches of the mango trees were literally covered with this grayish-white giant mealy bug.

Another serious mango pest that does not occur in Hawaii is a psyllid, *Apsylla cistellata* Buckton, the nymphs of which produce galls on the terminal buds of the mango tree. During May, 1960, severe damage caused by this pest was observed in the region of Dehra Dun, north India, where nearly all of the terminal buds of many trees were deformed as the result of its attack. It has been reported that this pest also occurs in other parts of India (Singh, 1954).

The twig borer, *Chlumatia transversa* Walker, is at times damaging to mangoes. The damage is caused by the caterpillars boring into the young twigs soon after the flush. Observations at Saharanpur, India, showed that during May, 1960, the damage by this pest was not severe. However, during the September to October flush it has been reported that as much as 40 per cent of the new twigs are damaged (Singh, 1957).

Lychee, *Litchi chinensis* Sonn.

The lychee, a fruit of Chinese origin, is a popular fruit in Hawaii as well as in India. In India this fruit is grown in private enclaves and in commercial orchards.

FIG. 1. Diseases of mango, *Mangifera indica* L., and papaya, *Carica papaya* L.; top left, "malformation disease" of the terminal shoot of mango; top right, "malformation disease" of the inflorescence of mango; bottom, virus disease symptoms of papaya. Note crinkling of the terminal leaves of the papaya tree to the left.



The most serious pest of lychee in Hawaii is the Erinose mite, *Aceria litchii* Keifer (Nishida and Holdaway, 1955). Characteristic injury symptom caused by this mite was observed in various localities in India, but in general the damage was not severe even though no control measures were being taken.

Orchids, *Vanda* spp.

Hundreds of species, varieties and hybrids of orchids belonging to 75 or more genera are grown in Hawaii (Neal, 1948). Nearly all of these have been imported from foreign countries and with them have come orchid pests, in spite of rigid quarantine regulations. In Dehra Dun, north India, *Vanda* spp. were found growing wild on mango trees. Many of the orchid plants were infested with small white larvae resembling those of *Orchidophilus* weevils which are present in Hawaii. In the foothills of the Himalayas on the way to Darjeeling both *Vanda* spp. and *Dendrobium* spp. were seen growing high up on the trees, but it was not possible to examine these plants.

Papaya, *Carica papaya* L.

The papaya, a native of tropical America (Neal, 1948), is grown in Hawaii as well as in many other countries. In India this fruit, which is called "papeya" in the Bengali dialect, is grown in the tropical as well as the sub-tropical areas. The popular Solo variety of Hawaii was not observed in India. In the Kanpur areas a number of trees were found infected with what appeared to be a severe virus disease which apparently does not occur in Hawaii. The terminal leaves of the diseased trees were yellowish green and crinkled to such an extent that the trees were stunted (Figure 1, bottom). According to Dr. Srivastava, State Entomologist, this disease is distributed throughout Uttar Pradesh; however, it rarely causes severe damage to papaya orchards.

Coconut, *Cocos nucifera* L.

In Hawaii the coconut is used chiefly as an ornamental plant; however, in south India, as well as in other parts of the world where the coconut grows, it provides food and shelter for the people. In south India coconut fruits (called "Tenga" in the Tamil dialect) as well as articles made of coconut shells, fibers, and leaves, were found in the markets. As in many other parts of the world, the Rhinoceros beetle, *Oryctes rhinoceros* L. (which fortunately does not occur in Hawaii) is the principal pest of the coconut in India.

SUMMARY

This paper presents an annotated list of plants that are common to both India and Hawaii, and that are of interest to Hawaiian entomologists because they are either noxious weeds in Hawaii which entomologists are interested in controlling biologically, or are crop or ornamental plants infested by insects or infected by diseases not present in Hawaii. Included in this list are seven species of noxious weeds and five of cultivated plants.

LITERATURE CITED

- BESS, H. A. and F. H. HARAMOTO. 1956. Biological Control of Pamakani, *Eupatorium adenophorum*, in Hawaii by a Tephritid Gall Fly, *Procecidochares utilis*. I. The Life History of the Fly and its Effectiveness in the Control of the Weed. PROC. TENTH INT. CONG. ENT. 4:543-548.
- CHATTERJEE, S. B. 1953. INDIAN CLIMATOLOGY. Commercial Printers. 63A Hari Ghose St. Calcutta 6, India.
- CLAGG, C. F. 1954. Notes and Exhibitions. PROC. HAW. ENT. SOC. 15(2):278.
- DAVIS, C. J. 1958. Recent Introductions for Biological Control in Hawaii. III. PROC. HAW. ENT. SOC. 16(3):356-358.
- 1959. Recent Introductions for Biological Control in Hawaii. IV. PROC. HAW. ENT. SOC. 17(1):62-66.
- 1960. Recent Introductions for Biological Control in Hawaii. V. PROC. HAW. ENT. SOC. 17(2):244-248.
- FULLAWAY, D. T. 1954. Notes and Exhibitions. PROC. HAW. ENT. SOC. 15(2):280.
- HOSAKA, E. Y. and J. C. RIPPERTON. 1944. Legumes of the Hawaiian Ranges. HAW. AGRIC. EXP. STA. BULL. 93.
- HOSAKA, E. Y. and ALAN THISTLE. 1954. Noxious Plants of the Hawaiian Ranges. HAWAII AGRIC. EXT. SERV. BULL. 62.
- NAMBA, R. 1956. Descriptions of the Immature Stages and Notes on the Biology of *Ithome concolorella* (Chambers) (Lepidoptera:Cosmopterygidae), a Pest of Kiawe in the Hawaiian Islands. PROC. HAW. ENT. SOC. 16(1):95-100.
- NEAL, M. C. 1948. In Gardens of Hawaii. B. P. BISHOP MUS. SPECIAL PUB. 40.
- NISHIDA, T. and F. G. HOLDAWAY. 1955. The Erinose Mite of Lychee. HAW. AGRIC. EXP. STA. CIR. 48.
- SINGH, S. M. 1954. Studies on *Apylla cistellata* Buckton causing Mango Galls in India. JOUR. ECON. ENT. 47(4):563-564.
- 1955. Malformation Disease of Mango (*Mangifera indica* Linn.). CURRENT SCIENCE 24:168-169.
- 1957. Further Studies in the Control of Mango Malformation Disease. SCIENCE AND CULTURE 22:394-395.
- 1957. A Serious Damage to Mango Shoots by the Borer, *Chlumatia transversa* Wlk., in Uttar Pradesh. IND. JOUR. HORT. SCI. 14(4):1-3.
- WEBER, P. W. 1951. Recent Liberations of Beneficial Insects in Hawaii. PROC. HAW. ENT. SOC. 14(2):327-330.
- 1956. Recent Introductions for Biological Control in Hawaii. I. PROC. HAW. ENT. SOC. 16(1):162-163.