

NOTES

Ipomoea carnea Jacq. A New Aquatic Weed Problem in India

H. CHAUDHURI¹, T. RAMAPRABHU² AND V. RAMACHANDRAN³

INTRODUCTION

Ipomoea carnea Jacq., a native of South America, was introduced in India (Hooker 1885) at the end of the last century as a garden and hedge plant (Haines 1925). Since then it has become a weed and spread rapidly on land and in water.

The plant spreads on land in many habitats and may cause obstruction and difficulties in the proper use of the land for cultivation or otherwise, and in water it affects irrigation, navigation, and fisheries. The rapid growth rate, spread, and adaptability from aquatic to xerophytic habitats (Mohanty and Mishra 1963) indicate this plant may potentially become another ecological disaster in India like waterhyacinth (*Eichhornia crassipes* (Mart.) Solms) and *Salvinia* spp. Many of the available accounts on aquatic weeds in India (Biswas and Calder 1954, Subramanyam 1962, Philipose et al. 1970) have not mentioned it as an aquatic weed and its control by any method has also not been described (Chakravarti 1963, Philipose 1968, Parker 1970).

The plant is now established in many parts of India and is quite common in ponds and other water areas in Orissa, West Bengal and Andhra Pradesh States, growing in shallow littoral areas and spreading occasionally into deeper waters. Elsewhere it grows into dense populations along river beds, embankments, canals and other water-logged (wetland) areas and contributes to the mosquito nuisance as noted by the health authorities in Cuttack.

There is only mention of the names *Argyreia superbiens* and *A. splendens*, *I. crassicaulis* Robinson (Misra 1963 a,b) and *I. carnea* Jacq. (Bor and Raizada 1954, Pal and Krishnamurti 1967) referring to the plant. The habit of the plant is vinelike but stems can grow upwards to a height of 5 to 6 m on land, while the aquatic plants are shorter, growing not only near the margins in shallow water but also as rooted emergent plants 1 to 2 m above the water. The branches are found mostly at the base of the stem, which is short and stout, but firmly rooted in the soil. Sometimes the stem bends along the soil/water surface producing small adventitious roots on the ventral side. The

leaves are triangular, about 10 cm long and 5 cm broad at the widest region and tapering towards the distal end. They are attached to the stem by means of long petioles (5 to 10 cm) from the cordate base of the leaf. Mohanty and Mishra (1963) reported that leaf area and stomatal numbers are greater in xerophytic plants than those in the aquatic habitat. The total biomass including stems and leaves in the densest infestations usually does not exceed 100 tons (fresh weight) per hectare. The flowers are large, flesh colored or rose to pink in garden varieties, arranged in axillary or terminal lax dichotomous cymes. Plants have been observed flowering in May and June, but along the coastal districts of Orissa they have also been noted to flower during winter. The flowers open fully during the day and wither by evening from which the plant derives the name, day or morning glory. The inflorescence stalk is longer (5 to 10 cm) than the flower stalks (1.25 to 1.5 cm). Within the flower are 5 small, broad, subequal oblong sepals, a large purple hypocrateriform corolla and a fruit (a septicidal capsule) 12 mm long is formed containing 4 seeds covered by brown pubescence.

PROPAGATION AND SPREAD

The plant propagates vegetatively by stems which are capable of rooting within a few days. Decumbent branches root in the soil before growing upwards establishing new plants separately from the main plant. Ornamental hedges are prepared by planting stem cuttings of *I. carnea*. These ornamental uses have aided the plants dissemination into new regions. During floods and other natural calamities, plants are swept off river beds and embankments and become established in downstream habitats. The collection of plants for fuel also leads to the spread of the plant to other areas. Similarly, garden enthusiasts in earlier days have also unknowingly disseminated the plant. Some years ago there was an intensive drive to grow the plant everywhere in Orissa for use as a green manure which has resulted only in uncontrollable populations in many locations.

Reproduction by seed is also common. Fruits dehisce during winter by the splitting of the dry fruit-wall and the hairy seeds are dispersed by wind as well as water. The seeds do not germinate immediately because of a hard seed coat which is impervious to water. Germination is increased (Misra 1963 a,b) by the removal of the seed coat and also varies according to temperature and treatment.

¹Professor, UPLB, College, Laguna P.O. Box 0142, Philippines, 4031.

²Principal Scientist, Central Institute of Freshwater Aquaculture, 170, 8th Cross, 7th Main, Malleswaram, Bangalore, India.

³Fisheries Consultant, Madras, India. Received for Publication May 8, 1992 and in Revised Form November 16, 1993.

TABLE 1. CONTROL OF *IPOMOEA CARNEA* JACQ. BY 2,4-D SODIUM SALT IN SEVERAL FIELD TRIALS IN INDIA.

Field trial	Doses (kg a.i. ha ⁻¹)	Spray volume (l ha ⁻¹)	Doses above which 90% controlled	Regeneration
1	5, 10	5000	5	0
2	1, 2, 3, 4, 5	2000	2	5-10% after 3 months
3	2, 5	800-2000	2	-ditto-
4	3, 5, 5	1000	2.5	5-10% after 5 weeks
5	5	1000	5	-ditto-
6	5	1000	5	5-10% after 2-3 months
7	3	2000	3	0
8	1, 2	2000	2	0
9	2	2000	2	10%
10	2	2000	2	10%
11	1.07	2000	1.07	Not observed
12	2.32	2000	2.32	10%
13	8	2000	8.00	0

CONTROL MEASURES AND DISCUSSION

Manual control measures by cutting and digging of stems, though commonly undertaken, are costly and ineffective. Any remaining stems and seeds that are in the soil easily and rapidly re-infest the cleared areas. In a field trial at Cuttack, a small plot of 0.15 ha was cleared manually by 10 men in 10-6 hour working days.

The herbicide 2,4-D (2,4-dichlorophenoxy acetic acid) is known to be effective against *Ipomoea* spp. (Robinson et al. 1952) including *I. carnea* (Singh and Adlakha 1966). In field trials doses of 1 to 3 kg 2,4-D ha⁻¹ in 0.05 to 0.5 percent aqueous solution usually provided over 90 percent control (Table 1). It was noted that unless plants are thoroughly sprayed, many escape the spray in dense infestations and regrow rapidly. The fine spray of the ordinary compression or power sprayers does not reach sufficiently far or high enough to cover the upper leaves of tall *I. carnea* plants. Hence high volume sprays of more than 1,000 l ha⁻¹ were employed in a fine shower directed towards the top of the weed beds. It was noted that with this volume spray droplets would fall onto the lower leaves as well as smaller understory plants preventing regrowth.

Regeneration of about 10 percent of the original number of plants occurred in areas sprayed at doses of 1 to 2 kg 2,4-D ha⁻¹, but usually did not occur at higher application rates.

Other herbicides such as 2,4,5-T at the rate of 5 kg a.i. ha⁻¹, paraquat at 0.2 kg a.i. ha⁻¹, and asulam at 2.5 kg ha⁻¹ were also evaluated, but none of these were found suitable or effective in the field trials.

I. carnea is a serious weed problem affecting fisheries, agriculture, irrigation and various other aspects of concern to man because of its wide range of ecological adaptability. It has been noted not only in this country, but also in Indonesia (Soerjani 1973). Control of this weed by 2,4-D formulations is possible provided timely spraying operations are undertaken and follow-up control measures are used to control regrowth from vegetative growth or seed germination.

LITERATURE CITED

- Biswas, K. and C. C. Calder. 1954. Hand-book of Common Water and Marsh Plants of India and Burma. 2nd edition, Government of India Press, Calcutta. pp. 177.
- Bor, H. L. and M. B. Raizada. 1954. Some Beautiful Indian Climbers and Shrubs. The Bombay Natural History Society, Bombay. pp. 286.
- Chakravarti, S. C. 1963. Weed Control in India - A Review. Indian Agriculturist 7: 1-58.
- Haines, H. P. 1925. The Botany of Bihar and Orissa. Reprinted Edition. Botanical Survey of India, Calcutta.
- Hooker, J. D. 1885. The Flora of British India. Reeve and Co., London. Col. 4. pp. 179-228.
- Misra, R. N. 1963. A. Germination of seeds of *Ipomoea crassicaulis* (Benth.) Robinson. Journal of Indian Botanical Society 42(3): 358-365.
- Misra, R. N. 1963. B. Occurrence of medullary cork in *Ipomoea crassicaulis* (Benth.) Robinson. Journal of Utkal University (Science), 3: 1-5.
- Mohanty, P. K. and P. Mishra. 1963. Stomatal distribution in relation to xeromorphy in aquatic plants. Nature 200(4909): 909-910.
- Pal, B. P. and S. Krishnamurti. 1967. Flowering Shrubs. Indian Council of Agricultural Research, New Delhi, 155 pp.
- Parker, C. 1970. Weed Control Report. SEATU Reg. Agric. Res. Project. Bangkok, 20 pp. Weed Abstracts 961: 144.
- Philipose, M. T. 1968. Present Trends in the Control of Weeds in Fish Cultural Water of Asia and Far East. FAO Fish. Report 44. 5: 25-52.
- Philipose, M. T., V. Ramachandran, S. B. Singh and T. Ramaprabhu. 1970. Some observations on the weeds of cultivable freshwaters in Orissa. Journal of the Inland Fisheries Society of India 2: 61-84.
- Robinson, W. W., A. S. Crafts and K. N. Raynor. 1952. Weed Control - A Text Book and Manual. McGraw Hill Book Co., Inc., New York.
- Singh, C. and P. A. Adlakha. 1966. Response of *Cannabis sativa* and *Ipomoea carnea* to the application of 2,4-dichlorophenoxy acetic acid. Proceedings 2nd. Weed Control Seminar, Department of Agronomy, Punjab Agricultural University.
- Soerjani, M. M. 1973. Aquatic Weed Problems in Indonesia with Special Reference to the Construction of Man Made Lakes. Doc. No. BIOTROP/TP/73/091. Regional Seminar on Noxious Aquatic Vegetation in the Tropics and Sub-tropics. NCEPC-INSA-UNESCO, New Delhi, 16 pp.
- Subramanyam, K. 1962. Aquatic Angiosperms. Botanical Monograph No. 3. Council of Scientific and Industrial Research, New Delhi. 100 pp.