REVIEW

MAKHANA R. K. Mishra, Vidyanath Jha &. P. V. Dehadri (Technical editors) published by Indian Council of Agricultural Research, New Delhi. 2003. 261 pp. ISBN 81-7164-003-6. Price: Rs.175.00

The cultivation of *Euryale ferox* Salisb. (Nymphaeaceae) for its valued seed kernels (known and traded under the name *makhana)* is income generative and more remunerative than other plants such as *Lotus, Lily, Trapa, Scirpus or Cyperus* species in wetland areas. However, this crop is not readily adopted owing to inherent drudgery in traditional cultivation. The seed collection (Sept.- Oct.) is a strenuous exercise and is executed by experienced fishermen. They crawl under water to sweep the nuts, collect them into heaps and then scoop out with horn shaped split bamboo contrivances. The collected seeds are brought ashore and thrashed manually to peel off the aril from the seed. Seeds are carried home for popping and sprinkled with water intermittently during storage to keep them afresh. The nuts are sun dried and preheated prior to roasting and popping which are again most arduous tasks.

The present compilation on various aspects of *makhana* crop, its distribution, ecology, biology, agronomy and pests is a requisite effort to consolidate the available information. Its greater potential for cultivation on a large scale in many abandoned water bodies, scope of its exploitation as a more popular plant food and its great export potential are other good reasons for this endeavour. Impressive in appearance, neatly bound, double coloured (bright blue and shining yellow) cover and prominently titled *"MAKHANA"* in white print on it, the book under review conveys itself that it is all about *makhana* and *makhana* alone! The book consists of 31 papers in 11 sections, Section I "Distribution" has 5 papers and covers Kashmir, Manipur, Orissa and West Bengal, and also Bangladesh. States like Assam, Bihar, Meghalaya, Rajasthan, Tripura and Uttar Pradesh are omitted where it grows in equal abundance. Section II has five papers on "Biology and Ecology" and much of it relates to phenological clock from sowing upwards to harvesting, traditional cultivation, biotic associations, biomass and productivity and issues linked to rapid shrinkage in cultivation. The presence of both chasmogamous and cleistogamous flowers, their size and fruits they produce and number of seeds they contain and their ecological significance are detailed in greater clarity. Section III "Soil -Water chemistry" presents physico-chemical environment and the authors list 28 points defining the environment where the plant can grow and with biomass and productivity figures. Section IV stresses on scope of integration of fish culture with *makhana* farming. It is now realized by mixing judiciously with selected species of fishes, it generates income attractive to rural farmers. Fish culture in *makhana* ponds can be as a secondary crop of fish after *makhana,* concurrent culture along with *makhana* or a continuous fish culture, transferring the fish to specially built ponds or channels during the harvest period of *makhana.* Sluggish and fast growing fish are identified to grow well with *makhana.* The Indian major carps, *Rohu (Labeo rohita)* and *Mrigal (Cirrhinus mrigala)* and the only exotic carp *(Cyprinus calpio)* are suited for stocking in *makhana* ponds. Stocking schedules are given taking into account the various stages of *makhana* cultivation as well as harvesting schedules. Section V, 'Economics' (based on cultivation from Kosi division of Bihar), analyses that *makhana* cultivation fetches an income of Rs. 35000/- per hectare and a great chunk of expenditure

(Rs. 11000/-) is incurred towards labour charges in seed broadcasting, seed collection and popping. Much of useful information appears in second paper (J.N. Choudhary & others) in this section and pertains to production and marketing. *Makhana* plants are often infected by a number of insect pests and Section VI extensively deals with pest controls in 6 papers on various diseases. Benzene hexa chloride, Eldrin and Malathion are applied to control aphids. Section VII deals with contamination of *makhana* with toxins and toxic residues due to poor handling, improper sanitation, insect damage, poor storage conditions and careless packing and some suggestions are made how to keep the produce free of aflatoxins and other mycotoxins. Section VIII handles post harvest technology of this crop that involves drying, grading, preheating, tempering, roasting, popping, grading and polishing. Information given here has great relevance, as there is great drudgery in these activities in traditional cultivation. Section IX titled 'New areas' features the integration of *makhana* cultivation with pisciculture and with little difference in theme from that of Section IV. Section X provides nutritional and medicinal properties of *makhana,* its varied uses in different parts of the country and also amino acid and protein content, AA index and biological value. Section XI gives details of indigenous contrivances utilized in *makhana* cultivation in North and North-eastern India.

The book has few problems in its organization, language and the material presented. It is expected to bring in the whole gamut of information so far published on *makhana* at one place and the book certainly has achieved this objective by cross referring to *ca* 300 publications. But when a book is attempted by multiple authors, there is a greater job on the editors' part to see language and presentation uniform and various articles included are better organized to develop a wholesome account on the elected subject. Probably there seem to be no guidelines given in writing papers particularly under "Distribution" as they lack- both order and uniformity. In some there is much superfluous material that adds volume and not content. In fact distribution patterns should have been presented country-wise instead they are dealt at state level. There are no papers from China, Russia and Taiwan and only one from Japan where this plant is known to grow. The plant name *(Euryale ferox)* is associated with the author's name (Salisbury) throughout the book, which is redundant. Fruits/ buds are shown as flowers (pp. 38). The reproduction of some of the black and white photos is of poor quality and adds no value to the publication. The exposure to and adoption of improved machinery possibly eliminates drudgery in its cultivation and encourages people to grow this crop. A summing up should have been executed by editors projecting issues, prospects and research needs on the subject. The book is affordably priced and contributes, in spite of stated lapses, towards popularization of this crop in potential wetland areas.

M. Sanjappa
Botanical Survey of India, Kolkata
and
P. Venu
Botanical Survey of India, Hyderabad