India is recognized as one of the mega-
biiodiversity countries of the world and
nurthes enormous plant diversity. It is
estimated that as many as 5289 species
of angiosperms belonging to 140 genera
are endemic to the country. However,
this plant wealth is eroding at a fast pace
due to habitat loss, fragmentation, over
exploitation, invasion of exotics, pollution
and climate change. According to Singh
and Khurana, about 25% of the higher
plant species is expected to disappear in
the next few decades and another 25%
may be lost by the end of the 21st century.
The growing awareness of the impor-
tance of plant diversity and the rapid de-
cline that has come to notice, have given
an unprecedented impetus for monitoring
and conservation. A variety of approaches
and techniques both in-situ and ex-situ,
have been proposed and implemented for
conservation of plant resources. The in-
situ strategy emphasizes on the protec-
tion of natural ecosystems for the conserva-
tion of overall diversity of genes, species
and ecological processes. Biosphere Re-
erves, National Parks and Wildlife
Sanctuaries have been set up. The ex-situ
strategies rely on botanical gardens, con-
servation stands, seed and pollen banks
and germplasm banks to help conserve
species outside the natural habitat. India
relies heavily on both these approaches.
The ex-situ approach finds more applica-
tions for economic plants and the in-situ
approach for wild plants. However, the
existing conservation strategies do not
guarantee an effective protection of the
rare, endangered and threatened (RET)
species.

Any conservation approach has to be
based on an in-depth study of plant
reproductive biology. Reproductive char-
acteristics such as seed dispersal, germin-
iation capacity, survival rate of seedlings
and adults, age at flowering, reproduc-
tive lifespan and number of flowers and
seeds refer to a set of responses that al-
low a species to adapt to a particular en-
vironment. Besides these, the processes
of gamete development, pollination, endo-
sperm and embryo development and other
reproductive features can provide
important clues regarding the reproduc-
tive constraints of plants that need con-
servation. The studies can also help in
developing certain protocols to combat
the problems that impede regeneration.
Understanding reproductive biology of
plants where there are few propagules for
future generations will yield promising
results. Botanists around the world have
been concentrating on comparative and
descriptive embryology and have gener-
ated a pool of data and information re-
grading various reproductive features
and anomalies in a large number of
plants. However, most of the valuable
information has not been put to use in
those aspects of study which are crucial for
conservation.

Although habitat fragmentation and
over exploitation are the more apparent
casual factors, failure of reproductive
processes to cope with environmental
changes is often the fundamental reason
for species loss. Sexual reproduction is
the only natural process that incorporates
variability and ensures survival of spe-
cies under adverse conditions. Sexual re-
production is based on the phenomenon
of syngamy and double-fertilization.
Successful fertilization is dependent on
effective pollination. Pollination studies
alone can provide a gamut of information
about the loss of many species, because
pollination is the fundamental step in
plant reproduction. Successful pollination
is an essential pre-requisite for survival
of plants in natural communities and is
dependent on many biotic and abiotic
factors. Plants have coevolved with their
pollinators and large ecological changes
can decouple their coinciding flowering
and breeding cycles. Conservationists
need to focus on the pollinators and their
biology as well while framing any con-
servation strategy. Wilcock and Neiland
have assigned the decline of many omen-
tophilous and entomophilous plants to
unsuccessful pollination because of loss of
their pollinators. For outcrossing of
entomophilous plants, population size
and plant density are closely associated
with the attraction and activity of polli-
nators. Because small populations may
be less attractive to pollinators, the reduc-
tion in population size results in decreased
fruit or seed production because of insuf-
cient pollen transfer. Some plants have
narrow amplitude in which these can
flower and fruit. The conditions must be
favourable for plants to produce flowers.
A study conducted by a reproductive bio-
logy group in Italy on Rhus aculeataus, an
evergreen shrub, has yielded some inter-
esting results. On the RET list the plant
is threatened because of unsuccessful
pollination. Information was gathered in
the laboratory by observing the absence
of pollen grains on the stigmatic surface
of 80 flowers in anthesis samples rando-
mly in field during the flowering period.
Studies on the reproductive biology of
Lactoris fernandeeziana, an endemic plant
of an island in Chile belonging to a mono-
typic family Lactoridaceae, have helped
in conserving the species. Seed germina-
tion and seedling vigour are problems,
and promotion of outcrossing helps in its
survival.

For biodiversity conservation, reclamation
and restoration, study of reproductive
biology can provide important paradigms.
Such studies would prove to be fruitful in
planning various programmes specific to
different habitats. Studies in reproduc-
tive biology will also help in developing
strategies to preserve the genetic potential
of rare species and are crucial for restora-
tion and reintroduction. The knowledge
will also help in the reintroduction of
many plant species which are raised by
micropropagation techniques. Many of
the micropropagation protocols that pro-
duce positive results in laboratories fail
to take-off in the field because of lack of
information about their reproductive fea-
tures. This information will be useful for
designing mathematical models and au-
gmentation programmes and make our
conservation efforts successful. The
studies can provide information for pre-
serving seedling longevity, pollen viabil-
ity and prolonging dormancy in seed banks
and pollen banks. Reproductive biology
studies thus have to be an integral feature
of all conservation projects.

1. Annual Report, Botanical Survey of India,
2. Rathcke, B. J. and Jules, E. S., Curr. Sci.,
4. Wilcock, C. C. and Neiland, N. R. M.,
6. Arnonne, G., Veronica De, M. and Scala,
7. Bernardello, G., Anderson, G. J., Lopez,
P., Cleland, M. A., Stuessy, T. F. and

Monika Koul Moza is in the Department of
Botany, Hans Raj College, University of Delhi,
Delhi 110 007, India and A. K. Bhatnagar is in
the Department of Botany, University of Delhi,
Delhi 110 007, India.
 e-mail: monikakb@rediffmail.com

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