GENETIC DIVERSITY AND REPRODUCTIVE BIOLOGY OF *JATROPHA CURCAS* L.

AMBROSI D.G.*, PURELLI M.**, GALLA G.*, FABBRI A.**, BARCACCIA G.*

*) Dept. of Environmental Agronomy and Crop Science, University of Padova, Campus of Agripolis, Viale dell’Università 16, 35020 Legnaro, Padova, Italy
**) Geneticlab s.r.l., Via Corte Ferrighi 16/B, 36025 Noventa Vicentina, Vicenza, Italy

population genetics, apomixis, molecular markers, flow cytometric seed screens, biodiesel

*Jatropha curcas* L. is a drought-resistant, photo-insensitive perennial tree plant belonging to the spurge family (*Euphorbiaceae*). This species probably originated in Mexico or neighbouring parts of Central America, but it was introduced all over the world long ago and is now naturalized throughout the tropical and subtropical areas. *J. curcas* is becoming an increasingly popular oleaginous crop in several developed countries for its proposed value in the lipids, biopharmaceuticals, cosmetics and biopesticides industry. Mainly it is known as a source of oil-rich seeds (*i.e.* fat content of whole seeds varies up to 45%) traditionally used for the production of soap and biofuel. It is worth mentioning that the seed oil is not edible as it contains toxic compounds and antinutritional factors. Despite the potentials as a source of vegetable oil for the replacement of petroleum and the interest that is being shown in the large-scale plantation systems of *J. curcas* in newly cultivated areas of Africa, America and Asia, the genetic structure of local varieties remains poorly characterized and breeding programs for the selection of improved varieties are scanty in this species.

*J. curcas* is a monoic plant with unisexual flowers, being male and female flowers produced in the same raceme. On the basis of available information, 68% of seeds are set through amphimixis, mainly by outcrossing (enthomophylous pollination), even if the species is self-compatible and hence selfing is also possible. At the population level, the average degree of apomixis is equal to 32%. Agamospermy (*i.e.* embryo sacs and embryos produced in ovules without meiotic reduction or egg cell fertilization), as a mode of asexual reproduction through seed, leads to clonality. Nevertheless, the species seems also to show a tendency to promote xenogamy (*i.e.* union of genetically unrelated organisms) and to minimize geitonogamy (*i.e.* the pollination of a flower with the pollen from another flower on the same plant), mechanisms that increase diversity.

The aim of this work is to gain an insight into the population genetics and reproduction dynamics of *J. curcas*. This species is characterized by a relatively small genome size (*2C*=0.85), corresponding to about 430 Mbp: it has a basic chromosome number equal to 11, and its populations are composed mainly of diploids (*2n*=2*xy*=22), although triploid and tetraploid chromosome numbers have rarely been reported. The determination of ploidy and the reconstruction of reproductive strategy in local populations of *J. curcas* from India, Sry Lanka, Brazil, Peru, Mexico, Nicaragua, Somalia, Togo, etc. were determined by means of flow cytometric seed screen (FCSS), a method suitable for the discrimination of either pseudogamous or autonomous apomixis from sexuality (*i.e.* amphimixis) based on the seed DNA contents of embryo and endosperm. The investigation of genetic variation within and differentiation among populations was carried out exploiting nuclear DNA markers, mainly AFLP (amplified fragment length
polymorphism) and SSR (simple sequence repeat) markers, whereas phylogenetic relationships were reconstructed on the basis of SNP (single nucleotide polymorphism) markers for chloroplastic DNA genic and intergenic regions.

A more profound knowledge of the mechanisms that regulate reproductive events and that affect the genetic structure of populations in *J. curcas* would contribute fundamentally to understanding i) the patterns of seed formation, ii) the potentials of genetic recombination, iii) the dynamics of natural populations, and iv) the strategies for breeding improved varieties.