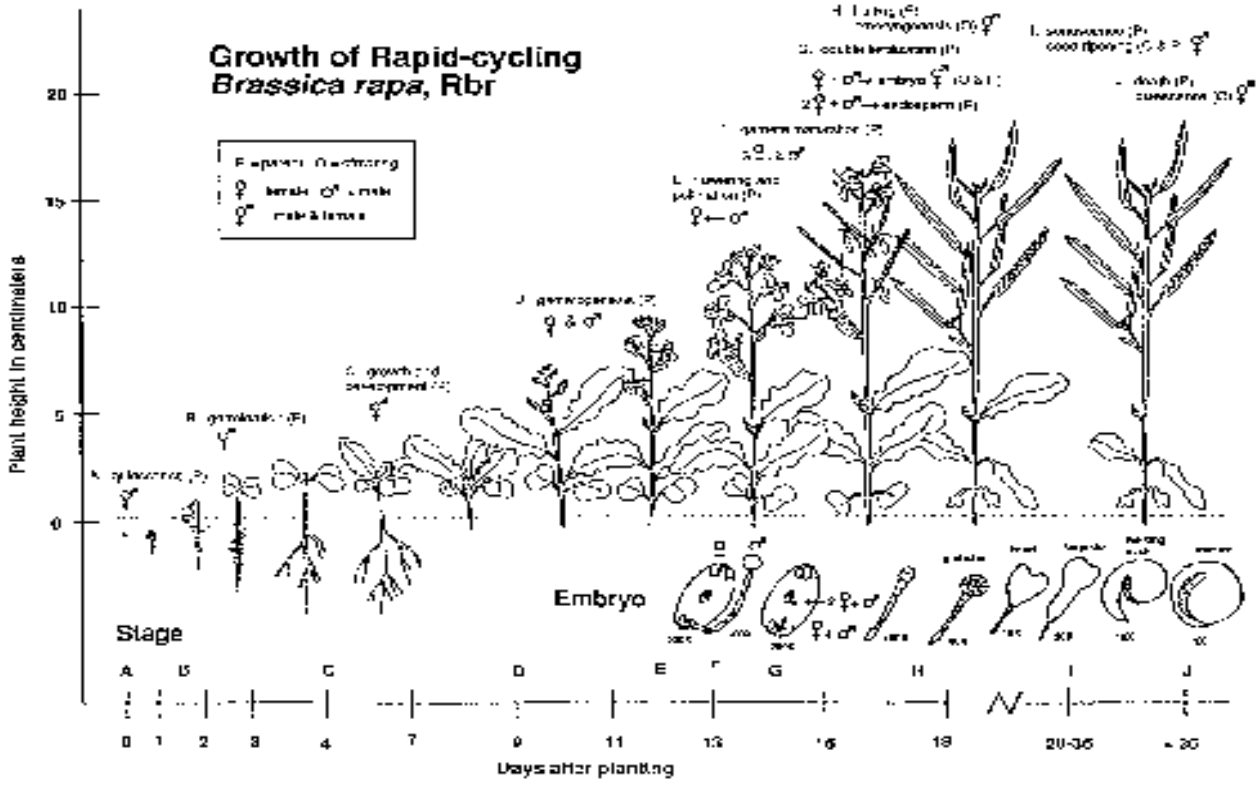
The Cycle of Life

The Concept of a Life Cycle

Life on Earth is comprised of populations of individuals whose life span varies from a few hours (bacteria) to hundreds or even thousands of years (some trees). It is through the cycle of life of individuals, repeated from one generation to the next, that life of a group of organisms or species is continued on Earth. For many organisms, life of an individual begins with *fertilization*, the time when specialized reproductive cells representing the contributions of a single egg (female) and a sperm (male) come together to form the *zygote*, or first cell of the new generation. In higher organisms the zygote divides repeatedly progressing through the stages of growth and development, eventually becoming a mature adult, producing reproductive cells which contribute to yet another generation. The ways in which various organisms complete their life cycles to accommodate living in complex and ever changing environments are extremely varied and a fascinating part of biology.

The growing of rapid cycling *Brassica rapa*, Rbr, through a life cycle from seed to seed can provide the basis for learning many aspects of biology that are relevant to the students' understanding of themselves as individual organisms among the many others inhabiting the Earth.

The growth chart shown below and table on page 2 provide you with different ways of understanding the Cycle of Life. By looking at the life cycle of Fast Plants from the perspective of the stages of growth and development from seed to seed, a framework can be developed for understnading the nature of the dependency between organisms and their environment.



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Stages in the Life Cycle of Fast Plants: Concepts of Dependency

Stage	State	Condition	Dependency
A. seed	• quiescence (dormant embryo)	• suspended growth of embryo	• independent of the parent and many components of the environment
B. germinating seed	• germination	• awakening of growth	• dependent on environment and health of the individual
C. vegetative growth	• growth and development	• roots, stems, leaves grow rapidly, plant is sexually immature	• dependent on environment
D. immature plant	• flower bud development	• gametogenesis — reproductive [male (pollen) and female (egg)] cell production	• dependent on healthy vegetative plant
E. mature plant	• flowering • mating	• pollination — attracting or capturing pollen	• dependent on pollen carriers; bees and other insects
F. mature plant	• pollen growth	• gamete maturation • germination and growth of pollen tube	• dependent on compatibility of pollen with stigma and style
G. mature plant	• double fertilization	• union of gametes • union of sperm (n) and egg (n) to produce diploid zygote (2n) • union of sperm (n) and fusion nucleus (2n) to produce endosperm (3n)	• dependent on compatibility and healthy plant
H. mature parent plant *plus* embryo	• developing fruit • developing endosperm • developing embryo	• embryogenesis — growth and development of endosperm and embryo • growth of supporting parental tissue of the fruit (pod)	• interdependency among developing embryo, endosperm, developing pod and supporting mature parental plant
I. aging parent plant *plus* maturing embryo	• senescence of parent • maturation of fruit • seed development	• withering of leaves of parent plant • yellowing pods, drying embryo • suspension of embryo growth, development of seed coat	• seed is becoming independent of the parent
J. dead parent plant *plus* seed	• death, desiccation • seed quiescence	• drying of all plant parts, dry pods will disperse seeds	• seed (embryo) is independent of parent, but is dependent on the pod and the environment for dispersal