Evolution of phenological plasticity in *Parthenium hysterophorus* in response to air pollution stress and unordered environmental variation

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SUMMARY

Strong phenotypic plasticity in *Parthenium hysterophorus* regarding life span, height of plant, flowering time, under pollutant stress, particularly air pollution stress were observed. Environment might be more important in determining genetic and phenotypic changes. There was also increasing evidence that the amount and pattern of expressing genetic variation itself was environment dependence. *Parthenium hysterophorus* showed adaptive phenotypic evolution within range of environments.

Key words : Phenotypic plasticity, *Parthenium*, Ecotype, Environmental variation.

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With the tremendous scientific and technological advancement, man has to a large extent succeeded in controlling and dominating nature. Plant species contain a tremendous amount of genetic variation, both within and between populations. This genetic variation shows up in the morphological and physiological traits of plants adapted to survive in different climates. Turreson (1922a) defined an ecotype as a population of plants that is genetically differentiated in response to the conditions of a particular habitat. An ecotype reflects the elevation, precipitation, temperature, growing season, soil and site characteristics where the population is found (Turreson, 1922b).

Sessile modular organisms, such as plants, which cannot migrate when environmental conditions change and whose modules may experience different environments, benefit from mechanisms to cope with environmental heterogeneity. Because most organisms, and certainly plants, change their phenotype in response to environmental change. It is often assumed that phenotypic plasticity has frequently evolved as an adaptation to environmental heterogeneity. Many phenotypic responses to environmental stress, however, may be the consequence of passive reductions in growth due to resource limitation. Moreover, phenotypic plasticity does not necessarily evolve as an adaptation but alternatively can evolve due to genetic correlations with other traits that are under selection or due to genetic drift. Therefore, plasticity of a trait does not necessarily imply that it is adaptive (Clausen *et al.*, 1940).

Organisms can respond to environmental stress in such a way that their tolerance zones may change. Each species is fairly well adapted or fit, if it has been in its particular environment for many generations. The range of tolerance of a species may be narrow (*i.e.* species has a low ecological amplitude) or broad (*i.e.* species has a high ecological amplitude). Thus, organisms are "Slaves" to the physical environment, they adopt themselves and modify the physical environment so as to reduce the limiting effect of temperature, light, water and other physical conditions of existence. Species have wide geographical distribution, almost always develop locally adapted populations called ecotypes, that have optima and limits of tolerances adjusted to local conditions (Clausen *et al.*, 1939).

In this context the present work was undertaken for serval purpose, first to compare samples taken from the same natural population, but in different years and thus analyse, the genetic stability of a local population not only for its characters, but also for its plasticity. Second to provide a precise comparison of the different responses norms according to different ecological niches. Studies on flowering and leafing phenology have dramatically increased during the last few decades because changes in plant phenology can be indicative of possible effect of climate change at multiple scale.