Impact on the Phenological Events of Plants under Stress Conditions of Auto-Exhaust Pollution

Dr. Anita Pawar
Asst. Prof. Department of Botany
N.R.E.C. College, Khurja, U.P., India

*Present paper deals with the impact of auto-exhaust pollution on the phenological events of **Withania somnifera** and **Amaranthus viridis** growing along the road side. For study purpose three sites were identified i.e Highly Polluted Area (HPA), Medium Polluted Area (MPA) and Fresh Area (FA-Control), in city Ghaziabad which is an important industrial town of western U.P.. Various phenological events like-germination, vegetative growth, flowering and fruiting etc. were recorded. It was found that different plants respond differently to the stress and life cycle was noticed short under stressed conditions of pollution.*

Keywords: Auto-exhaust, *Withania somnifera, Amaranthus viridis*, Highly Polluted Area (HPA), Medium Polluted Area (MPA).

1. INTRODUCTION

Environmental pollution and human efforts for the betterment of living standard are two sides of the same coin. In wake of urbanization, consequent industrialization and increasing population, the basic amenities of life v.z. Air, water and soil being polluted continuously. Due to a sharp increase in the vehicular population in recent years, the automobile emissions now constitute a major source of environmental pollution all over the world. India is a developing country, and this problem is much more aggravated due to factors such a narrow and congested highways and old and poorly maintained vehicles. The automobile emissions are released at the ground level and have adverse effect on the overall growth of plants. Various parameters such as phenology, leaf morphology, seed weight, seed germination, chlorophyll and ascorbic acid etc. reported to be effected by automobile emission [1-11].

Phenology is the study of periodical changes in the plants in relation to the season of the year. This paper deals with the changes recorded in the phenological events of *Withania somnifera* and *Amaranthus viridis* growing along the road sides.

2. MATERIALS AND METHODS

The present investigation was carried out on two common road side plants to assess their relative sensitivity for vehicular exhaust pollution. The selected plant were *Withania somnifera* and *Amaranthus viridis*.

In Ghaziabad city three sites were selected for the present investigation i.e. High Polluted Area (HPA), Medium Polluted Area (MPA) and Fresh Area (FA). Highly Polluted

Areas taken for consideration were those areas which have high traffic density viz. Mohan Nagar crossing, Meerut mod crossing, New and old bus stand, Hapur Chungi and Lal Kuan, Medium polluted Area were considered those areas having lesser traffic load than highly polluted Area viz. Internal roads passing through the city. Area considered as control area named-Fresh Area were situated away from roads.

Phenological events such as-period of seed germination, plants vegetative growth, flowering, fruiting and death (In case of seasonal plants) of the plants selected for present investigation, were recorded weekly by surveying the selected sites i.e. HPA, MPA and FA.

3. RESULT AND DISCUSSION

Withania somnifera showed, similar period of germination (June to August) and vegetative growth (Mid of June onwards) at all the three sites selected for present studies i.e. FA, MPA and HPA. However flowering and fruiting periods were recorded shorter at MPA and HPA sites in comparison to control i.e FA site in Table 1. *Withania somnifera* is a perennial plant.

Table 1: Effect of auto exhaust pollution on the phenology of *Withania somnifera*.

Sites / Attributes	FA	MPA	HPA
Germination	June, July and August	June, July and August	June, July and August
Vegetative Growth	Mid of June onwards	Mid of June onwards	Mid of June onwards
Flowering	January, Feb., March and April	January, Feb. and March	January, Feb. and March
Fruiting	End of Feb., March, April May and June	End of Feb., March, April and May	End of Feb., March, April and May
Death	Perennial Plants	Perennial Plants	Perennial Plants

Phenological events of *Amaranthus viridis* were found effected at HPA site, whereas at MPA site no difference was noted in comparison to control as shown in Table 2. The germination was delayed by one month at HPA site and consequently other events of life cycle get delayed i.e. vegetative growth, flowering and fruiting. At FA and MPA sites maximum number of *Amaranthus viridis* plants disappeared, in the month of July and August. But on other hand at HPA site inspite of delayed germination, the population of the same species become significantly thin in the months of July and August.

Table 2: Effect of auto exhaust pollution on the phenology of *Amaranthus viridis*.

Sites / Attributes	FA	MPA	HPA
Germination	End of March, April, May and June	End of March, April, May and June	End of April, May and June
Vegetative Growth	April onwards	April onwards	Ist week of May
Flowering	Mid of April, May and June	Mid of April, May and June	Mid of May and June
Fruiting	End of April, May and June	End of April, May and June	End of May and June
Death	Maximum number of plants disappeared in July and August	Maximum number of plants disappeared in July and August	Maximum number of plants disappeared at the end of July and August

Different plants respond differently to the stressed condition of automobile exhaust pollution [4,5]. Flowering and fruiting period of *Withania somnifera* was found short at polluted sites-MPA and HPA. It means vehicular exhaust has affected reproductive capacity to some extent. On other hand *Amaranthus viridis* showed marked variation only at HPA site in period of germination, vegetative growth, flowering and fruiting. Probably the germination was delayed due to prolong resting stage of embryo in stressed effected seeds. It was also noted that the duration of life cycle was cut short in HPA site plants it was because under such conditions plants might be cautions to complete their life cycle speedly, similar observations were also recorded by other researchers [12,13].

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