

## IMPACT OF VEHICULAR EMISSION ON SEED GERMINATION OF SOME ROADSIDE TREES

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The seeds of *A. Lebbeck* and *D. Sissoo* collected from the polluted areas of city showed significant reduction in seed germination. The seeds of *P. roxburghii* also showed reduction in germination but they were not significant. The rate of germination of *A. lebbeck* collected from city areas showed maximum effects of pollution. The seeds collected from Liaquatabad area showed comparatively less germination as compared to other sites in the city.

**Key words:** Seed germination, Roadside trees, Vehicular emission.

### Introduction

Karachi is the largest city of Pakistan and about 22% of the total urban population of the country and nearly half of the country's auto vehicles of transportation consisting of taxis, rickshaws, buses and private mini buses are seen in Karachi. According to an unpublished survey report of PCSIR, the concentration of smoke at Karachi (M.A. Jinnah Road) was 100-200 µg/cubic meter, whereas the carbon dioxide concentration was 10.15 ppm. The vegetation near the main roads may contain 500 ppm by weight of lead (Pb) and such vegetation is unsuitable for animal and human consumption [1]. Krishnayya and Bedi [2] had studied the effect of automobile exhaust lead (Pb) on *Cassia tora* and *C. occidentalis*. They found lethal impact of lead on seed viability. Howell and Rose [3] studied the effect of air pollution on percent seed germination and chemical composition.

The main purpose of this study was to investigate the effect of automobile exhaust on seed germination of some road side trees. This type of study might be helpful in obtaining pollution tolerant species.

### Materials and Methods

The seeds of *Albizia lebbeck* (L) Benth., *Peltophorum roxburghii* (G.Don.) Degener and *Dalbergia sissoo* Roxb. were collected from Nazimabad, Liaquatabad and Gulshan-e-Iqbal areas. Seeds were also collected from Karachi University Campus, which was considered as control area. The seeds of *A. lebbeck* and *P. roxburghii* were rubbed with sand paper because of hard seed coat, whereas the seeds of *D. sissoo* didn't require any type of treatment. Before checking the rate of germination all the seeds were soaked in dilute solution of mercuric chloride to avoid any type of fungal growth during seed germination.

Germination test was performed in large size Petri dishes (14cm in diameter), in which filter paper of the same size were placed. In each Petri dish, 10 seeds of the assigned species

were kept and the experiment was replicated five times. The data was statistically analysed by analysis of variance and students Newman-Keul's multiple range test.

### Results and Discussion

The seeds of *A. lebbeck*, *D. sissoo* and *P. roxburghii*, collected from the University campus, which was considered as control area showed high rate of germination (Table 1) whereas the seeds of all the species collected from the city areas showed comparatively less germination particularly in Liaquatabad. Seed germination of *A. lebbeck* and *D. sissoo* were significantly different ( $p < 0.05$ ) between control and polluted sites.

The reduction in seed germination was also recorded in seeds of *P. roxburghii* which were collected from the polluted sites in comparison with control, but the reduction was not significant. Average percentage reduction in seed germination for each species for all polluted sites in comparison with control showed that seeds of *A. lebbeck* were badly affected by automobile pollution (Table 1). Whereas, the seed germination of *P. roxburghii* was comparatively less affected in the city atmosphere.

In Karachi city, the traffic density is high and vehicles passing through these areas contributes excessive exhaust which contain different types of pollutants. The smoke concentration along the main road is quite high and according to a research report in some parts of the city area, the smoke concentration was as high as 270 µg/cubic meter [4]. Due to high concentration of different pollutants in the atmosphere, climatic and bioclimatic factor like temperature, humidity, wind velocity etc. were also affected [5]. The presence of various pollutant in the atmosphere from motor vehicles have been reported by many workers [6-8].

The rate of seed germination showed that seeds of *P. roxburghii* were least affected and this may be due to the presence of thick seed pod. The pods of two other species

TABLE 1. PERCENT GERMINATION OF SEEDS AND AVERAGE PERCENTAGE REDUCTION IN SEED GERMINATION OF DIFFERENT SPECIES AS COMPARED TO CONTROL

Seed collection sites	Percentage seed germination			Average % reduction in germination (As compared to control)			Average of all spp. for each site
	<i>A. lebbbeck</i>	<i>P. roxburghii</i>	<i>D. sissoo</i>	<i>A. lebbbeck</i>	<i>P. roxburghii</i>	<i>D. sissoo</i>	
University Campus	98 a	98 a	100 a	—	—	—	—
Gulshan-e-Iqbal	74 bcd	88 a	94 b	26	12	06	14.7
Liaquatabad	68 cb	94 a	86 c	32	06	14	17.3
Nazimabad	82 d	90 a	78 d	18	10	22	16.7
Average	—	—	—	25.30	9.30	14.00	—

Statistical significance determined by analysis of variance. Number followed by different letters in each row is significantly different ( $p < 0.05$ ) according to Student's Newman-Keul's multiple range test.

were not so thick. High levels of lead around the main roads of Karachi had been reported by Beg *et al.* [4]. The presence of this metal or of other metals (e.g Cd, Cu, Hg etc) could also be responsible for the reduction in seed germination in city trees. Krishnayya and Bedi [2] had also observed reduction in germination in the polluted sites. They observed that lead pollution affected the seed germination and viability near the highways. Howell and Rose [3] had reported the secondary effects of air pollution on percent seed germination and chemical composition of seeds derived from ozone treated plants. There was no effect due to presence of ozone. These observations are different in comparison to our findings. We found that presence of different automobile pollutants and might be of ozone, an important automobile pollutant [6] caused reduction in seed germination. Deposition of particulate matter on the leaves and seed pod in the polluted areas was found, whereas no such deposition was observed in the campus area. Similarly, Sahu and Warriar [9] had observed the deposition on road side plants. Jaeger *et al.* [10] had found that physiological and biochemical aspects of plants were affected by air pollution, such types of physiological and biochemical changes in plant due to air pollution caused effect on seed viability.

The germination of seed could also be affected by the development of unhealthy seeds by trees growing along the main roads in city area. Bhatti and Iqbal [11] reported that leaf length, leaf area and leaf weight in different road side plant growing in the city were significantly reduced as compared to control.

On the basis of this study, it could be concluded that seed viability was more affected in seed collection from Liaquatabad

area as compared to control and other polluted sites. Similarly, *A. lebbbeck* was found as the most susceptible species to automobile pollution. *P. roxburghii* seeds which showed most resistance against the automobile pollution might survive due to presence of thick and hard seed pod, whereas the seed pods of other two species were thin and the pollutants might had affected the seeds.

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