Postgraduate education in university departments

Having retired as a professor of chemistry from Veer Narmad South Gujarat University, Surat after serving for 24 years I am tempted to comment on the quality of postgraduate (PG) education in departments of universities and affiliated colleges. In many departments, new teachers are not appointed to replace the retired faculty. As recurring expenditure of the universities has to be borne by the State Governments, they do not make new appointments. This has resulted in almost 50% decrease in the number of faculty. They manage with retired visiting professors or hiring freshers on contract by paying consolidated salaries of Rs 15,000–20,000 per month. The number of students and branches of study is increased with no proportionate increase in the regular faculty. This leads to the downfall of education and research in PG departments. The University Grants Commission (UGC) is generous in allocating funds for buildings, equipment, etc. but these are not properly utilized. Even when UGC sanctions new teaching positions, State Governments are not enthusiastic in filling them, as they have to bear the financial burden after 5 years. Due to career advancement schemes for teachers, learned and talented persons do not move to other universities. This results in prototype research in all departments.

Though new equipment are purchased, they are not properly utilized due to lack of maintenance and no revision of curriculum. Many costly equipment get junked in a few years. They become obsolete and cannot be repaired. There is no accountability for effective utilization of equipment. Technical assistants to maintain sophisticated machines are not appointed by universities, as their salaries have to be paid from the grants of State Governments.

All these factors have resulted in the decline of PG education and research. Though there is a great demand from the industries for good students with Master's degree, universities are unable to fulfil the demand. It is high time that UGC reviews the situation and takes some concrete measures to improve PG education and research in the country.

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'Rootlet to seed': a new technology for high-quality carrot seed production in one year

High farm inputs increase production cost and food prices, which is the most important issue worldwide. Several scientists are engaged in developing new, low-cost farmer-friendly methods for crop production in agriculture sector. Among the vegetable crops, carrot (*Daucus carota*, $2n = 2x = 18$, family Apiaceae) is an essential part of the diet for a large section of society and is used globally. Apart from culinary use, carrot is credited with many medicinal properties. It helps in the maintenance of acid–alkaline balance in the body and to improve eyesight. Carrot seeds are aromatic, stimulant, carminative and useful in diseases of the kidney and in dropsy[1].

It is well known that temperate carrot produces seeds commercially by 'root to seed' method in two cropping seasons and about 2.0 metric tonne roots are required for planting 1 ha of land. Roots produced in the first year require storage at low temperature/vernalization to induce seed stalk and flower initiation[2]. These stored roots are planted the next year/cropping season. Therefore, this method takes 18–24 months for seed production. Worldwide, about 0.228 million metric tonne carrots are utilized for seed production using the 'root to seed' method.

The Defence Institute of High Altitude Research (DIHAR), the 'world's highest research laboratory working on agro-animal technologies' under Defence Research and Development Organization, Leh-Ladakh has invented 'rootlet to seed', a new technology of high-quality carrot seed production within a year and at a low cost. In this method, seed is sown in November in nursery beds of a 10.0 m × 3.0 m × 1.0 m semi-underground passive greenhouse and it is covered with 200 μm thick translucent polythene from November to February[3]. After germination, the plants are kept in this passive greenhouse up to February. During this period the plants received naturally available, low-temperature vernalization

Figure 1. ***a***, Rootlets of carrot. ***b***, Carrot seed crop from rootlets.

by manipulating the opening/covering time of the greenhouse by the polythene sheets. Very less irrigation and nutrients are provided so that the plants in the greenhouse just survive and produce small-sized roots called 'rootlets'. These rootlets (about 12 g each) enter directly in the reproductive phase. The rootlets are harvested and transplanted in the field in March for commercial seed production (Figure 1).

On the basis of three years' (2009–2011) field experiments, it was found that rootlets induced seed stalk and inflorescence 70–80 days after transplantation and produced seeds in October during the same year. Therefore, with this technology one phase (root production phase) can be avoided completely using an eco-friendly method and high-quality seeds can be successfully produced in one year. Including the losses during handling and storage for the next season about 2.0 metric tonne carrots can be made available for table purposes; otherwise, these would have been used for seed production in the 'root to seed' method.

Higher seed yield per hectare and quality were recorded with 'rootlet to seed' compared to 'root to seed' method, apparently due to the contribution of maximum seeds from first- and second-order umbels. However, higher seed yield per plant was observed in 'root to seed' method, and the third- and fourth-order umbels contribute in seed yield in this method. Seeds produced in the third- and fourth-order umbels are inferior in quality than first- and second-order umbels, because these small-sized seeds contain higher levels of carrotal substance which inhibits germination and adversely affects the vigour[4]. Therefore, high germination percentage and seed vigour were observed in the seeds produced using 'rootlets to seed' technology.

With the adoption of 'rootlet to seed' technology developed by DIHAR, food used for seed production as carrot roots (2.0 metric tonne/ha) can be saved and good quality seed can be produced in one year at almost one-third cost in comparison to the conventional method.

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Plastic litters: a major environmental issue in Chilika lagoon

Chilika Lake is the Asia's largest brackish water lagoon situated in Odisha along the Indian east coast. It is one of the biodiversity hotspots and a good source of fishery in coastal wetlands of the entire east coast. Its Nalaban Island bird sanctuary serves as a wintering ground for thousands of migratory and resident birds every year. It is also one of the few lagoons in the world which supports congregation of Irrawaddy dolphins. The lake since its origin about 5000 years ago is providing an array of goods and services to the local community. At present more than two lakh fisher folk population living in and around the lake are obtaining their livelihood from this lake. The health, tranquility and peace of the lake have been affected, rather severely, during the last few decades due to natural hazards and anthropogenic interventions. One of the important polluting attributes figured in recent years in this lake is the plastic litter fall.

The use of plastic materials in various fields including fishing has increased tremendously due to their low cost and durability. Plastics are usually non-biodegradable; microbe and other organisms living in the natural environments cannot break down these polymers. Therefore, plastic materials such as carry bags, bottles, food wrappers, residual and damaged fishing nets pose a potential threat to the environment and the biota. Plastic litters are entering into coastal ecosystems from many different sources, especially through the dumping of damaged carry bags, bottles, packing materials, ropes and other materials used in navigation and residues of fishing nets, etc. Synthetic materials like biologically non-degradable nylon fabrics are widely used in the preparation of fishing nets and fishermen dump the damaged nets in the natural environment ignoring their adverse impacts on the biota. The plastic litter fall in coastal wetlands has in fact been recognized as a nuisance practice.

Plastic litters are entering into the Chilika lagoon from many different sources (Figure 1). These include plastic waste of domestic and industrial origin through rivers and rivulets debouching freshwater into the lake and dumping of damaged plastic nets and net residues used in 'gheri' culture (pen culture). Of late, dumping of plastic materials like bottles, packing materials, water pouches, carry bags, etc. has aggravated the situation. The villages surrounding the lagoon have no proper waste disposal and management system, which promotes the addition of residual plastic into the lake system. The plastic litter fall therefore has emerged as a new environmental problem threatening its health and the inhabitants.

Plastic litters can interfere in the ecosystem functioning of an aquatic environment in more than one way. The organisms of all trophic levels and living as plankton and nekton in the pelagic realm and benthos are affected by persistent litter fall. It has been well established that these litters could alter the strength of biological interactions leading to the death of fragile benthic organisms, besides destroying the habitats. The resident and migratory birds usually depend upon the benthic organisms which serve as their food. Thus plastic litter fall could affect the bird populations of wetlands. Further, Sandilyan and Kathiresan[1] have observed that the carry bags hanging on the mangrove tree branches produce a peculiar sound during wind flow that disturbs the foraging of migratory and resident birds in Pichavaram mangrove area. The Chilika Lake