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NEWS

Hemp in the manufacture of paper

Hemp – *Cannabis sativa* (often called Indian hemp) – has been cultivated in India for centuries, especially in regions where rivers flood their banks, because the plant holds the soil and prevents soil erosion. The plant produces strong pliable fibres (the word 'hemp' is used for both the plant and the fibres). The fibres are extremely strong and have been used since antiquity for weaving sail cloth, and for making large diameter ropes used in ships etc.

The male plant bears flowers in axillary racemes and dies soon after pollination has taken place. The female plant bears flowers in crowded spikes and dies after the seeds mature. Plants of both sexes are used for fibre. The hemp stem is hollow and has an inner fibrous bark. While strong coarse fibres are obtained from mature plants, soft ones obtained from hemp harvested at pollination are used for making cloth of fine texture. The fibres from the bark are used to make a great variety of textile products.

Hemp contains the psychoactive drug tetrahydrocannabinol, popularly known as marijuana. Narcotics like charas, ganja, etc. have been extracted in India from the hemp plant for centuries.

More recently, material scientists in India have considered hemp fibres as ideal for making fibre-reinforced plastic (FRP) composites because of the strength and length of the fibres. Further, hemp fibres contain a fair proportion of amorphous silica, making them behave almost like glass fibres except that hemp fibres are much tougher. Hemp fibres add strength and stiffness to plastic products and can be used to substitute glass (G) in GFRP products. Attempts to use treated hemp fibre to substitute partially asbestos in 'asbestos cement sheets' (used for roofing) have been fairly successful.

Now comes the news (*Environmental Health Perspective*, 1995, **103**, 893–894) that hemp is one of the best fibre sources for paper and therefore could be used in its manufacture. It is much better than jute, kenaf, flax or bagasse. In recent experiments, high-quality bond paper has been produced with 10% hemp together with recycled paper pulp. Lower grade but strong paper has also been produced for copiers. Hemp paper is considered environmentally very good as no chlorine bleach or acid treatment is necessary. Cultivating hemp, it is said, will save trees and minimize pesticide demands. Since cultivating the marijuana plant in the US is illegal, hemp pulp is being imported into the US from China and Hungary. Attempts are also being made to use genetic engineering to produce hemp not containing the drug tetrahydrocannabinol. There are some negative aspects too – Hemp plants require nitrogenous fertilizers; so hemp fibres may be much costlier compared to other materials like wood, bamboo, etc. used in paper manufacture. One does not know how the high silica content in this fibre will affect the paper-making machines.

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CORRESPONDENCE

Nurturing young scientists

It is said in common scientific parlance that best scientific contributions come from 'young' researchers. More often than not, Nobel laureates are rewarded for their work that was performed in their mid-thirties. Younger researchers are, hence, a breed that need to be nurtured with care all around the world and India, in particular. Given the right impetus, support, and direction this flock of assertive dedicated individuals can perform wonders. This is especially important in our changed times when India needs to compete and succeed globally on all frontiers of technology.

Much to the chagrin of young investigators, however, the research environment in our country is forsakenly taken to be rather dull and sleepy. A project proposal to government agencies, in general, takes anywhere from six months to more than a year for appraisal, to which six more months are to be added for money disbursal. The young scientist

proposal is expected to take much less; yet, invariably it consumes a lot of time. In these days of rapid technological change a loss of one year in research activity is like unquestionably accepting the forced directive of being condemned to technological backwardness, if not obsolesence. In much the same token, inefficient and inadequate financial support produces equivalent result. More important is the associated danger of a young scientist losing the self-confidence and the drive to compete internationally when saddled with these time and money problems at such an early stage of his career. If the nation needs technology to be delivered for social benefits, it is imperative that all researchers, and especially the younger ones, are supported duly. A nation is what its young people are and what they want to be.

The Department of Science and Technology operates a scheme for initial support of young scientists (below 35 years) to perform research. The basic idea is to provide some quick seed money required to establish a new laboratory/facility and allow the young investigator to take roots. At the present time this scheme can at best provide an amount of Rs 3 lakhs for a two-year period. At the earliest, the administrative machinery at DST can initiate the operation of a project under this scheme in a minimum of six months time; most projects usually take more. The *modus operandi* of initiating a project includes securing at least two referee reports. Recently, the Board of Research in Nuclear Sciences has come up with a similar scheme having a Rs 5 lakhs financial cap. It is anticipated that a BRNS young scientist project will take much shorter time to initiate.

The present manner of administering young scientist proposals is ineffective. The amount of time taken in processing the applications is much too large; money disbursal is evidently belated. I present some additions and modifications to the present set-up to help the young researchers' fraternity. Following are my point-wise recommendations with a brief discussion of appropriate rationale:

- *India should not have multiple Young Scientist schemes running in different government agencies.* If the goal of each scheme is the same, we need not have one scheme competing with the other. One manager is usually better than multiple managers—why duplicate effort?
- *The administration/management of young scientist proposals be taken over by previous Young Scientists.* A group of previous young scientists, who have experienced the process earlier, be nominated for handling the research proposals. The rationale is that these scientists will better appreciate the needs of their cadre and speeden-up the entire process. Governmental delays regarding appraisals, cataloging, communication, etc. will be reduced drastically. In addition, the applications be treated in the same manner as scientific papers to expedite the process. The process of project appraisal will essentially remain the same, however, communication with established scientists will be improved. Younger investigators at premier institutions such as Tata Institute of Fundamental Research, Indian Institute of Science, Indian Institute of Technology, etc., may be appointed for handling these proposals.
- *The time required to process a Young Scientist proposal be reduced to a maximum of three months.* This should include the review process, the decision on whether to fund, and communicating the final decision.
- *The recommendations of the reviewers be followed in budgetary allocation.* The young investigator be intimated of the budgetary allocation and asked for his confirmation or appeal. The approval of the young investigator on budgetary aspects should be deemed necessary for the final approval before the project is submitted to the finance manager for money remittance.
- *A finance manager(s) be appointed aside from the proposals management group who will handle the money disbursal and money utilization part of the proposal.* Ideally he should be a young scientist. If not, a cell in one of government bodies be designated to solely handle this function.
- *Money should be sent to the concerned investigator within two months of the approval of the proposal.* It is imperative that this function is given utmost importance. Time saved is money gained. If a cell or manager is identified with this function only, drastic reduction in time required may be achieved.
- *The maximum financial support be set to Rs 10 lakhs for a two-year period.* Out of this an investigator can claim up to 80% for the first year. This will allow greater latitude in research organization of the project and in management of facilities. A young investigator needs greater financial support earlier in his career than later; more so when he is setting up his laboratory.
- *In the first 3 years of initiating research activities, a young scientist may be allowed to work with two Young Scientist projects subject to the condition that he/she has no funding from any other source.* The rationale for this is the following: Very often in the initial stages one is not certain about success in a particular area and wants to explore more before committing himself/herself to a certain direction. In addition, better laboratory funding will allow greater flexibility in choosing advanced laboratory equipment that may be necessary for research.
- *The feasibility of processing applications before the actual employment should be maintained and encouraged.*
- *Under special circumstances a young scientist be allowed to present his proposal before the review committee without submission before-hand to expedite his application.* Some unforeseen events may delay the submission of applications. If appropriately justified, an application be considered before a meeting of the review committee for possible funding. This will help save more than a year for the young applicant.

The basic goal in all the above suggestions is to reduce the time required to initiate a project. If the process is considerably improved it may serve as an incentive for young researchers abroad to return to their motherland and do some good. A very encouraging thought is the reduction in brain-drain.

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