DST INSPIRE programme: need for an extended version

The DST INSPIRE programme helps to attract and explore the hidden scientific talent of the country although people may have different perceptions regarding its budget, selection criteria and outcome[1,2]. Regarding selection, theoretically beside marks and intelligence, skill and interest level should also be considered. But for a large population and a big geographical area as well as for smooth functioning of this programme, the practical feasibility must be given preference[3]. To ensure the quality of the camp, the mentors feedback form should be sent directly to DST in sealed envelopes. Further, DST can construct panel(s) of Science Academy Fellows (may be region wise) to inspect INSPIRE science camp and submit their confidential report directly to DST in sealed envelope. Being a INSPIRE mentor, I have delivered talks and interacted with students in many camps and it has always remained an exciting experience to interact with budding young scientists. Students attending the camp are really inspired and professionally benefited by attending such camps at an early age.

The INSPIRE interns are from standard XI. To join the traditional research programme there is a time gap of at least 5–7 years. In such a long time any motivated student can divert from science to other disciplines. Therefore, this inspired lot must remain in touch with science. Now the question arises what next to boost inclination of INSPIRE interns towards science so that they can serve the country as a leading scientists. DST can adopt some steps to motivate these inspired future scientists; otherwise this scientific talent will go in vain.

(i) DST can evolve an evaluation system for the students who have attended the INSPIRE camp and depending upon the available resources, some of the INSPIRE interns can be exposed to certain leading laboratories and scientists for a definite period of time, strictly on the basis of merit and interest. They should submit a report of their visit to ensure their keen participation. Such screening can be done through mentors, course coordinators or by conducting examinations.

(ii) Some subject areas can be identified and specific short-term and regular coursework can be initiated for these motivated INSPIRE interns in the defined subject areas, just like the refresher courses of IASc–NASc–INSA.

(iii) The interns can be attached with INSPIRE mentors for 1–2 months every year as a visiting fellow to develop inclination towards science. DST can meet the expenses of such visits.

(iv) Mentors can also be given freedom to pick any talented students to induct him/her in their laboratory. Some financial assistance can be provided for this purpose.

(v) The top order INSPIRE intern as screened by mentors, course coordinator or through examination as suggested in point (i) can be rewarded with special incentive schemes like financial assistance to work on some model/problem or original idea and concept.

(vi) Some scholarships can also be awarded to needy but talented interns.

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Ethno-medico-botany is an adaptational strategy

Mountains are regarded as sacred, hotspots of biodiversity and unique for cultural diversity. However, mountains are also bestowed with adversities and harsh living conditions. People living in mountain need to cope with undulating terrain, massive upward and downward movement due to lack of transportation system and fluctuating diurnal temperatures. Therefore, physical injuries during movement and other problems due to cold environment are common. Bone fracture, cold and cough, cuts and wounds, fever, headache, indigestion, mouth and tongue sores, muscular pain, rheumatic pain, stomach ache, strains and toothache are common health problems in people in mountain areas. As an instant aid, locally available plants are used for treating incidental and common ailments. Bark of *Boehmeria rugulosa*, *Buxus wallichiana* and *Carpinus viminea* is used as a substitute for plaster; paste made from seeds of *Abrus precatorious* and *Vigna mungo* and paste from plants of *Coelogyne cristata* are used for treating bone fracture. Decoction of leaves of *Cinnamomum tamala*, *Origanum vulgare* and *Oscimum sanctum* is used for treating cold and cough. Fresh leaf juice of *Anaphalis contorta*, *Artemisia vulgaris* and *Symplocos paniculata*, paste prepared from roots of *Dactylorhiza hatageria* and powdered resin of *Cannabis sativa* are used for treating cuts and wounds. Whole plant powder of *Picrorhiza kurrooa* and decoction of leaves of *Swertia* sp. are used for treating fever. Paste of fruits of *Gaultheria trichophylla* is applied on the forehead for treating headache. Powder of roots of *Angelica glauca* and fresh fruit juice of *Hippophae rhamnoides* or *H. salicifolia* are used for improving digestion. Utilization of *Thymus serphyllum* (Figure 1) as spice helps in preventing constipation and promoting digestion in high-altitude areas. Paste of the bark of *Callicarpa macrophylla* is used to treat

Figure 1. *Thymus serphyllum*.

mouth and tongue sores. Massage with oil from seeds of *Corylus jacquemontii* helps in relieving muscular pain; boiling roots of *Aconitum atrox* in oil until it forms a paste and applying this same is helpful for treating rheumatic pain. Powder made from roots of *Aconitum heterophyllum* and *Ainsliaea aptera* is useful in relieving stomach ache. Drinking juice prepared from fresh rhizome of *Curcuma domestica* along with milk is useful for relieving strains and chewing the bark of *Daphne papyracea* helps in relieving toothache. These are some examples of treating common ailments through plants. Examples of application of plants for treating common and curable ailments in the mountain areas are given refs 1 and 2. Owing to exigencies, application of seeds, leaves, bark and whole plant for overcoming sudden health problems is intrinsic. In such cases, talking about prescription and doses are not common, and mode of application depends on availability of material and preparedness. Most of the rural people in mountain areas are more or less accustomed to use plants in a crude way. Therefore, application of locally available plants in crude way for treating some incidental and common ailments is an adaptational strategy of mountain communities for surviving in harsh environmental conditions. Scripting such folk knowledge is essential. It will be also useful if the attempts for screening of new medicinal compounds from ethno-medico-botanically important plants of the mountain areas can be initiated.

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Climate change is affecting apple cultivation in Himachal Pradesh

Mountains are early and important indicators of climate change which depict far-reaching consequences on our ecosystem, agriculture and livelihood of the farmers[1]. The Himalayan mountain ecosystem is also facing serious challenges posed by climate change due to increasing aridity, warmer winter season, and variability in receiving precipitation and snow. Apple is one of the most important commercial crops of the Himalayan region and Himachal Pradesh (HP) with 1.05 lakh ha area under apple cultivation, which fetches livelihood for more than two lakh farmers. The winter temperature and precipitation in the form of snow are important and sensitive climatic factors for induction of dormancy, bud break and also to ensure proper flowering in apples. The fruit requires 1200–1500 h of chilling depending on the type of cultivar. Chilling hours <1000 lead to poor fruit formation. Prolonged delay in cold in December and January severely affects the chilling requirements.

Reports suggest that in the last three decades, apple crop is getting affected in all the hilly regions due to climate change. During this period, the Himalayan region has warmed faster than most places in the world. Mean surface temperature in the Himalaya rose by 1.5°C from 1982 to 2006 compared to a 0.6°C rise in the global mean from 1975 to 2005. Some areas in the region saw maximum mean winter temperatures going up by as much as 3.4°C from the 1980s. Since the early 2000s, average temperature in the Himalayan mountains has increased by about 1°C, which is around four times the global average[2]. Temperature increases are more during winter and autumn than during summer, and it clearly increases with rise in altitude. Analysis of the data[3] indicates that decadal temperature rise remains up to 0.2°C till 2000 m altitude, while above 2000 m it often exceeds 0.3°C. These changes have been noticed across different regions of the Himalaya. Analysis of data of the last two decades of major apple-growing areas (Shimla, Kullu, Lahaul and Spiti) indicates that minimum temperature is decreasing per year from November to April, whereas maximum temperature has been showing an increasing trend from November to April[4]. The chill units critical for apple production have also showed a decreasing trend. Chill units have been recorded to decrease up to 2400 m amsl from Bajaura in Kullu at 1221 m amsl to Sarbo in Kinnaur at 2400 m amsl. Analysis of rainfall for the past 41 years recorded in Kullu district showed 77 mm increase during the period from November to May. Increase in precipitation and decrease in snowfall during winter consequently reflected in the low chilling hours in the region. Trend analysis indicated that snowfall is decreasing at the rate of 82.7 mm/annum in the entire region. Another study reports from the Kullu valley that rainfall has decreased by about 7 cm, snowfall by about 12 cm, the mean minimum and maximum temperatures[5] have increased by 0.25° and 1°C respectively, in 1990s compared to 1980s.

Consequences of these climate changes are visible clearly in the shifting of apple cultivation from lower elevations to higher altitudes in HP. Some of those important locations are Kullu valley in Kullu district, Rajgarh in Sirmaur district, Theog and Kotkhai in Shimla district, Churag and adjoining areas in Mandi district and some areas in Solan district. Early indications to poor fruit setting and lower productivity in delicious varieties were observed in 1990s. Apple-growing areas in low altitudes like Solan[6] have been reduced by as much as 77% between 1981 and 2007. During the same period, apple farming began in the higher-altitude areas of Kinnaur, Lahaul and Spiti, which were earlier considered too cold and dry. Apple cultivation has shifted to higher altitudes and apple yield mainly in lower altitudes has declined due to inadequate chilling as the temperature at lower altitudes is rising.