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# USE OF MAJOR PLANT SPECIES CONVERTING INTO CONVENTIONAL BEST BIO-FERTILIZERS (MANURE) IN GARHWAL HIMALAYA

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**Abstract:** *The present investigation deals with the comparative study of leaf litter of major plant species used to prepare bio-fertilizers by locals inhabiting in oak and pine zones of Garhwal Himalaya. A total 18 major plant species belonging to 14 different families were reported in present investigation, which has been used as leaf litter for the preparation of bio-fertilizers (manure). Among these species leaf litter of Quercus leucotrichophra, Rhododendron arboreum and Lyonia ovalifolia were highly used (as rank I–III) for the preparation of manure due to their availability through the year, while leaf litters of Alnus nepalensis, Betula alnoides, Carpinus viminiea, Acer pictum, Juglance regia and Aesculus indica were mostly preferred for best manure, but leaf litters of these species were not available through the year, because of its deciduous and early decomposing nature in oak zone while leaf litter of Pinus roxburghii was highly used in pine zone. The purpose of this study was documentation of those plants, which were frequently used in preparation of conventional bio-fertilizer on the basis of local's preferences. This study was necessary as it helps for the locals towards the enhancement of the organic farming and reduce the use of chemical fertilizers in point view of environmental conservation and health care.*

***Keywords:*** *Conventional bio-fertilizers, major species, PRA exercise, Species ranking, Garhwal Himalaya*

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## INTRODUCTION

Rudraprayag district ($79^0$-$79^0$ 30□ E Longitude and $30^0$ 30□-$30^0$ 42 N Latitude) is located in northern part of Central Himalaya with great floral and floral diversity. The geographical area is around 2328km. The main occupation of people residing in this region is agriculture and animal husbandry that acts a major source of income of these people. Forests are playing an important role in fulfill their daily needs as fuel fodder, timber wood, fiber, leaf litter and other forest produce to prepare bio-fertilizers and also other non timber forest produces.

Bio-fertilizer is the essential component of organic farming to increase crop productivity and to improve the soil fertility. The role of bio-fertilizers in sustainable crop production has been reviewed by several workers (Biswas et al. 1985; Wani and Lee, 1985, Katyal et al. 1994). Application of organic manures (bio-fertilizers) is the only option to improve the soil organic carbon for sustain of soil quality and future agriculture productivity (Ramesh, 2008).

Leaf litters of different plants species are playing an important role in the preparation of conventional bio-fertilizers. Locals used the leaf litters in cow sheds. After two or three days it mixed with cow dung. Such materials removed from the cow sheds and stored in protected area for two to five months, so that the materials decomposed completely before using it as manure.

The main object of this study was to document of indigenous knowledge of local's towards the plants and usage of their leaf litter for the preparation of conventional bio-fertilizer in oak and pine zones in relation to reduce chemical fertilizers.

## MATERIALS AND METHODS

For the present study six villages, (three villages from oak and three villages from pine dominated zones) were selected. The information was gathered through Participatory Rural Appraisal (PRA) method. The author organized PRA meeting at village level involving 15-20 villagers, which included experienced men and women, self-help groups and social workers. The information was gathered after the long sessions of discussion about leaf litter of plants which used in preparation of conventional bio-fertilizer. The information was gathered through species listing and ranking. Maximum 10 marks were given to the species according to its application in different categories (local abundance, uses in leaf litter, best manure) and mean values was calculated for each mentioned variables (1 marks=10%). Sum of the

mean of all variables lead to total marks obtained (M) for each species and those species are then ranked accordingly I to XIV.

**Table 1: Showing the ranks of plants of oak dominated zone (as leaf litter)**

| Botanical Name | Vernacular Name | Local Abundance | Used as leaf litter (for manure) | Best manure | Marks obtained | Rank |
|---|---|---|---|---|---|---|
| *Quercus leucotrichophora* A. Camus | Banj Oak | 10 | 10 | 5.6 | 25.6 | I |
| *Rhododendron arboreum* Smith. | Burans | 8.6 | 9.3 | 6.0 | 23.9 | II |
| *Lyonia ovalifolia* Wall. | Ayar | 6.6 | 8.3 | 7.3 | 22.2 | III |
| *Alnus nepalensis* D.Don. | Utees | 4.3 | 7.3 | 10.0 | 21.6 | IV |
| *Carpinus viminea* Wall. | Chamkharik | 3.6 | 6.0 | 8.3 | 17.9 | V |
| *Betula alnoides* Buch-Ham. | Saur | 4.3 | 4.6 | 8.3 | 17.2 | VI |
| *Acer pictum* Thunb. | Kanchul | 3.0 | 4.5 | 8.3 | 15.8 | VII |
| *Juglans regia* L. | Akhrot | 3.0 | 5.0 | 7.0 | 15.0 | VIII |
| *Aesculus indica* Hook. | Pangar | 2.5 | 4.0 | 8.0 | 14.5 | IX |
| *Machilus duthiei* King Ex. Hook. | Kaul | 3.6 | 4.5 | 6.2 | 14.3 | X |
| *Quercus glauca* Syn. | Faliyat | 3.0 | 6.2 | 5.0 | 14.2 | XI |
| *Litsea umbrosa* Nees. | Belad | 4.6 | 4.3 | 4.9 | 13.8 | XII |
| *Fraxinus micrantha* Engler. | Angu | 3.0 | 3.0 | 7.0 | 13.0 | XIII |
| *Symplocos chinensis* Lour. | Lodh | 2.5 | 2.0 | 5.5 | 10.0 | XIV |

**Table-2: Showing the ranks of plants of pine dominated zone (as leaf litter)**

| Botanical Name | Vernacular Name | Local Abundance | Used as leaf litter (for manure) | Best manure | Marks obtained | Rank |
|---|---|---|---|---|---|---|
| *Pinus roxburhii* Sargent | Chir | 10.0 | 10.0 | 7.0 | 27.0 | I |
| *Toona ciliata* M. Roem. | Toon | 6.3 | 5.3 | 7.3 | 18.9 | II |
| Butea monospermia | Mowa | 5.0 | 5.0 | 6.0 | 16.00 | III |
| *Bombax ceiba* L. | Semal | 3.0 | 2.3 | 6.6 | 11.9 | IV |

**(Source of Table** 1&2: Dhani Arya (2008), Ph.D. thesis submitted to HNB, Garhwal University, Srinagar, Garhwal, Uttarakhand, India)

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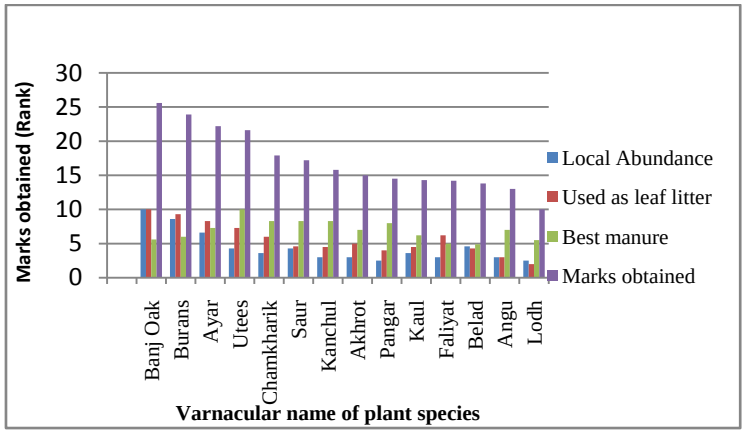


Fig 1: Graphical representation of the leaf litter (manure) in oak dominated zone

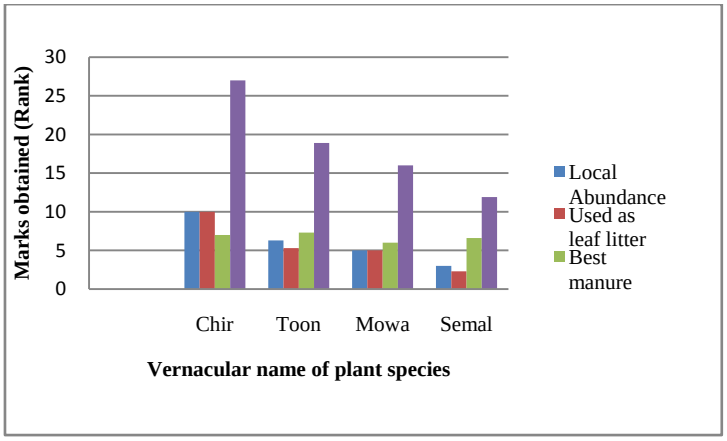


Fig 2: Graphical representation of the leaf litter (manure) in pine dominated zone

## RESULTS AND DISCUSSION

Comparative study regarding the use of plant species as leaf litter (dry leaves) to prepare bio-fertilizers (manure) by the villagers in oak and pine dominated zones indicates a total 17 major plant species being used (14 and 4 in oak and pine zones) respectively.

*Quercus leucotrichophora, Rhododendron arboreum* and *Lyonia ovalifolia* were highly used as leaf litter to prepare conventional manure (bio-fertilizers) in oak zone, due to their local abundance and availability throughout the year and then ranked (as I-III). Moreover these species, *Alnus nepalensis*, *Carpinus viminea*, *Betula alnoides*, *Juglans regia* and *Aesculus indica* were highly preferred to making of the best manure. (Table 1), But the leaf litters of these species were not available through the year, due to their deciduous and early decomposing nature. While *Pinus roxburghii* was mostly used in pine zone as leaf litter for the preparation of manure fallowed by *Toona ciliata* in comparison to *Butea monospermia* and *Bombax ceiba* (Table 2).

## CONCLUSION

The result reveals that the leaf litter of *Quercus leucotrichophora*, *Rhododendron arboretum* and *Lyonia ovalifolia* are frequently used as preparation of conventional bio-fertilizer in oak and *Pinus roxburghii* in pine zones of the study area. Locals were produced pure organic crops due to usage of bio-fertilizer. Because of market prices of these crops comparatively high of the other corps which were gown with usage of chemical fertilizers. Therefore, organic farming was beneficial towards the sustaining their livelihood as well as conservation of biological diversity and cure of health.

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