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Variations in Morphological Characteristics of *Ganoderma lucidum* Collected from Different Species

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Abstract: *Naturally growing Ganoderma lucidum (Leyss. ex. Fr.) on basal part of different tree species namely Desi kikar (Acacia nilotica), Neem (Azadirachta indica), Shisham (Dalbergia sissoo) and Siris (Albizia lebbek) was collected during rainy season 2013. These isolates were evaluated in vitro conditions for their morphological characteristics such as mycelial growth pattern, colony diameter, pigmentation and ring formation as well as fruiting body characteristics like size of stalk, shape of cap and color of fruit body. The observation depict that the fruiting body of Ganoderma lucidum had different morphological characters when compared among the different isolates, which collected from basal portion of different host tree species . The mycelial growth was fastest (90 mm) in isolate which collected from basal portion of Dalbergia sissoo host tree, after six days of incubation at 28 ±2°C on PDA. While the lowest mycelial growth (51 mm) was recorded in case of isolate obtained from basal portion of Acacia nilotica. The mycelial colony pattern was uniform in isolate collected from Dalbergia sissooand Acacia nilotica, while it was submerged in case of Albizia lebbek and raised in isolates of Azadirachta indica. It was also studies that, the culture of Albezia lebbak isolate produced clear cut rings, while it was not so in other isolates. The color of the colony changed from white to light yellow after three weeks; while it was dark brown in culture of Acacia nilotica and Albizia lebbeckisolates after four weeks of incubation at 28 ±2°C. There was no pigmentation in case of isolates collected from Dalbergia sissoo.*

Keywords: *Ganoderma lucidum, tree species, mycelial growth, colony pattern.*

INTRODUCTION

Ganoderma lucidum (Leyss. Ex. Fr.) commonaly called as "Reishi" while in Haryana, popularly called "Satpatra" or "Hirdo". All parts of this mushroom are used for health purpose and for pharmaceutical uses.The medicinal mushrooms are commonly prepared either as hot water extract, concentrate or in powdered form (Smith *et al.,* 2002). In India ethno-medicinal value of *G. lucidum* was first reported by Harsh *et al.* (1993). It is used as medicine and not as food because it is bitter and corky hard and this mushroom is pharmacologically as well as commercially most important medicinal mushroom in the world with current global trade in this mushroom is in the range of 1.5 billion US$, while it is about Rs.120 crores per annum in India (Geetha *et al*., 2012). Current world production of *G. lucidum* is around 6000 tonnes, half of which comes from China (Verma and Prasad, 2010).

G. lucidum is probably the first medicinal mushroom to gain importance in India. An attempt has been made in India to study the potential of medicinal mushrooms as an additional crop towards diversification. Most of the mushrooms are being cultivated on agro-residues like sawdust/wood chips/wheat straw/paddy straw. In India, these raw materials are available in plenty and the country produces about 600 million tonnes of crop residues per year (Tewari and Ahlawat, 2007). Indian conditions are quite congenial for cultivation of medicinal mushrooms and this may fetch more returns in the market (Thakur, 2005). Keeping in view, the scanty information available on the cultivation of this mushroom in India, present work was undertaken to standardize the optimum growth habit of *G. lucidum* under natural conditions.

MATERIALS AND METHODS

Fresh isolates of naturally growing *Ganoderma lucidum* (red mushroom)were collected from basal part of different host trees, of species such as*Desi kikar* (*Acacia nilotica*), Neem (*Azadirachta indica*), *Shisham* (*Dalbergia*

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sissoo) and Siris (*Albizia lebbek*), during rainy season 2013. These isolates were cultured on potato dextrose agar medium by tissue culture method and the fungus mycelium grew well at 28 ±2°C. The variation recorded among the culture of different isolates, based on morphological characteristics of mycelia included colony diameter, pattern, pigmentation and ring formation in the Petri plates under *in vitro* and visual appearance of fruit bodies characteristics such as size of stalk, shape of cap and color of fruiting body under natural condition. The best tree species was selected for further experimentationand the culture of *G. lucidum* isolate was maintained on potato dextrose agar medium at 4±1°C.

RESULTS AND DISCUSSION

The observations were recordedon their morphological characteristics such as mycelial growth pattern, colony diameter, ring formation, as well as fruiting body characteristics like size of stalk, shape of cap and color of fruiting body. It was depicted that (Table 1& Plate 1), the radial mycelial growth varied between 51 to 90 mm amongst isolates of different host tree species. The mycelial growth was fastest (90 mm) in isolate which collected from the base of tree species *Dalbergia sissoo*, followed by isolates of *Azadirachta indica* (81 mm) and *Albizia lebbeck* (56 mm) after six days of incubation on potato dextrose agar media at 28 ±2°C, while in case of isolate collected from *Acacia nilotica* the mycelial growth was very low (51 mm).

The differences in mycelial growth pattern and colony colour also observed during *G. lucidum* growth of different isolates which were collected from different tree species. The mycelial growth pattern was uniform and fluffy in isolates which were collected from base of host tree species namely *Dalbergia sissoo* and *Acacia nilotica*. On the other hand, it was submerged in isolates of host tree species *Albizia lebbeck* and raised in culture of *Azadirachta indica* isolate. The *G. lucidum* isolate of *Albizia lebbeck* produced clear cut ring during growth on PDA, while in other cases there was no such types of ring formation occurred. During the colony pigmentation the observation recorded that, color of the colony changed from white to light yellow after three weeks; while it was dark brown in isolates of host tree species *Acacia nilotica* and *Albizia lebbeck* after four weeks of incubation at 28 ±2°C and no pigmentation reported in case of culture obtained from the isolate of host tree species *Dalbergia sissoo*.

The variations amongst isolates were also reportedduring rainy season 2013, in terms of size of stalk, shape of capand color of fruiting body. The size of stalk wasalso variedwith isolates, it was short and thick (*Dalbergia sissoo*), long and thin (*Acacia nilotica*)and short to medium (*Albizia lebbek*)and undifferentiated in *Azadirachta indica* isolate.On the other hand, the shape of cap also differed with isolates of different host tree species, it was highly branched, bright and kidney shaped in isolate which obtained from host tree *Dalbergia sissoo* and cap was single and irregular in case of *Azadirachta indica* isolate. While, it was single, smooth and kidney shape in *Albizia lebbeck* isolate and less branched, rough and round in isolate of *Acacia nilotica*. The fruit bodies of all isolates were

Table 1
Variation in morphological characteristics of *G. lucidum* isolates collected from basal portion of different host tree spp

Collected isolates of G. lucidum	*Different host tree species*	*Mycelial characteristics*			*Fruiting body characteristics*		
		Growth on PDA 6 DAI (mm)	*Colony pattern*	*Colony pigmentation*	*Size of stalk*	*Shape of cap*	*Color of fruiting body*
G_1	*Shisham* (*Dalbergia sissoo*)	90	Uniform & flully	No. change	Short & thick	Highly branched, bright & kidney shape	Reddish brown
G_2	Neem (*Azadirachta indica*)	81	Raised	Light yellow after three weeks	undifferentiated	Single & irregular	Blackish brown
G_3	*Siris* (*Albizia lebbek*)	56	Submerged	Dark brown after four weeks	Short to medium	Single, smooth & kidney shaped	Light to dark brown
G_4	*Desi kikar* (*Acacia nilotica*)	51	Uniform	Dark brown after four weeks	Long & thin	Less branched rough & round	Dark brown

DAI- days after inoculation

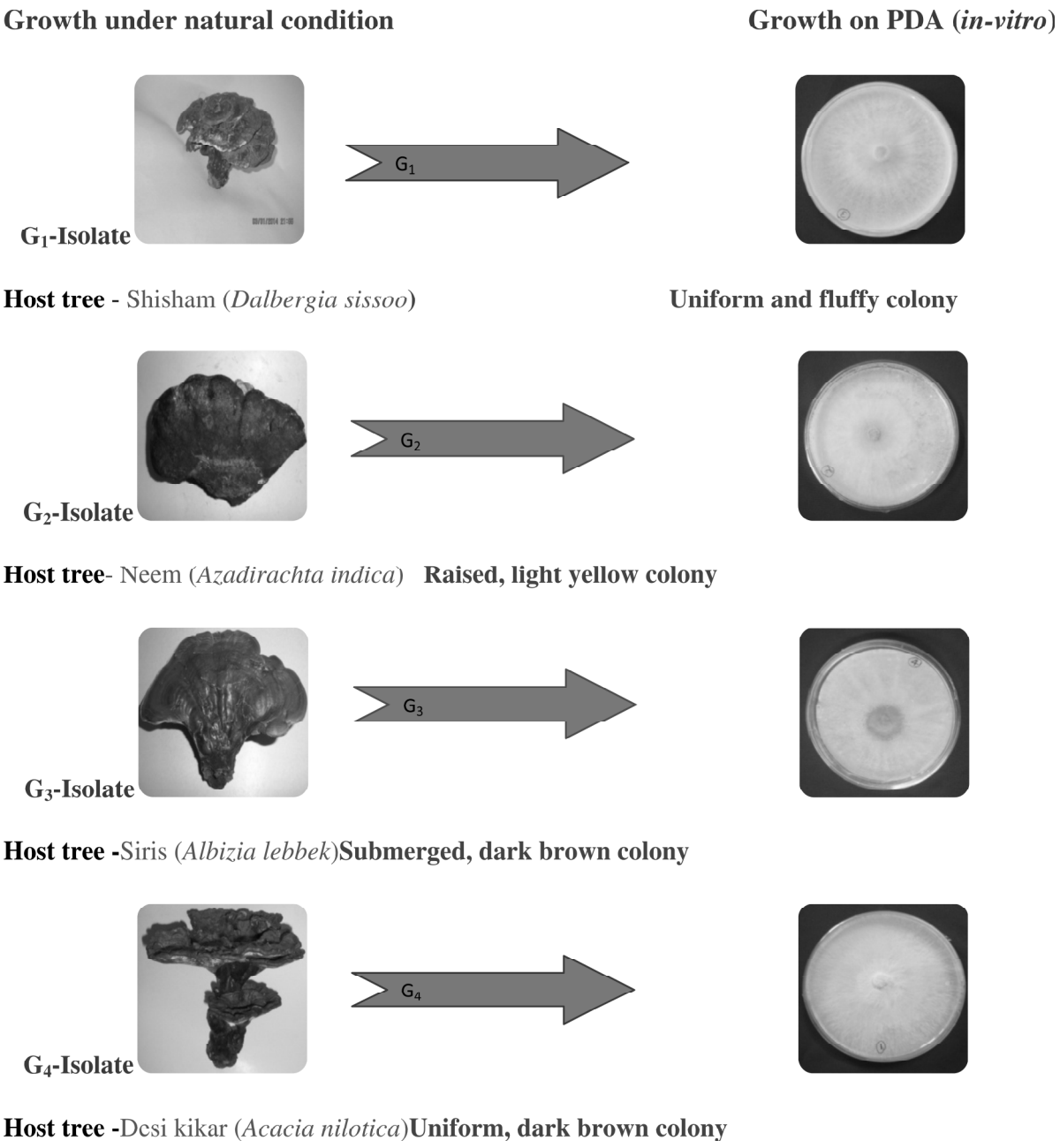

Plate 1: Variations in Isolates of *G. lucidum*Collected from Different species

mostly of brownish color but it was more reddish brown in *Dalbergia sissoo* and light to dark brown in case of *Albizia lebbeck*. Similarly, it was dark brown in *Acacia nilotica* and blackish brown in *Azadirachta indica*isolate.

SUMMARY AND CONCLUSION

Ganoderma lucidum has several host trees species in India and fresh isolates were obtained from infected roots for studies the morphological characteristics. It was reported that, maximum mycelial growth obtained on potato dextrose agar medium in culture which collected from host tree *Dalbergiasissoo* isolate. The observations of morphological characteristics show that, the variation exists among different isolatesof this mushroom, which obtained from basal portion of several host trees species.

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