

Some New Records of Black Mildew Fungi from Mahabaleshwar, Maharashtra State, India

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Received: 12 June 2016/Revised: 20 July 2016/Accepted: 20 August 2016

ABSTRACT. The present study deals with a total of 47 new records of black mildew fungi belonging to Meliolaceae, Asterinaceae, Schiffnerulaceae and fungi from Parodiopsidaceae groups, collected on different phanerogamic host plants from Mahabaleshwar and its surrounding areas of Satara district, Maharashtra state, India. Among these, *Meliola litseae* classified under family Meliolaceae (Meliolales) is found to be new record to the fungi of India and hence reported here for the first time from India. However, remaining 46 taxa are reported for the first time from the Maharashtra state.

Key-Words: Black mildew, Fungi, Mahabaleshwar, Maharashtra, Western Ghats.

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INTRODUCTION

The black mildew fungi are very specialized in their structures and habitat. These are inconspicuous, mostly foliicolous, superficial, obligate parasites, host specific and characterized by appressoria filamentous mycelium forming black colonies on the surface of living leaves, with generally tropical distribution. These are mainly from four groups' viz. Meliolaceae (characterized by strictly two celled appressoria, presence or absence of mycelial setae and consistent two to four septate ascospores), Asterinaceae (characterized by having shield-shaped thyrtothecia, splitting radially like a star or stellately or by longitudinal dehiscence and uniseptate ascospores), Schiffnerulaceae (well-known to show the connection between teleomorph and synanamorphs) and fungi from Parodiopsidaceae (characterized by presence of globose perithecium, dehiscing by irregular ostiole, consistently uniseptate ascospores) [1-4].

India has been the cradle for black mildew fungi and about 1159 taxa of black mildews are known from India [1-16].

Some of the researchers contributed certain number of these fungi from Maharashtra state [10-27]. Hence, this group of fungi attract the attention for extensive exploration and investigation from Maharashtra state.

During the exploration of black mildew fungi from Mahabaleshwar and its surrounding areas, one species of genus *Meliola* namely, *M. litseae* Syd. on *Litsea josephii* S. M. Almeida, is found to be new addition to the fungi of India and hence reported here for the first time from India on hitherto unreported host. However, 46 taxa (19 taxa of Meliolaceae; 20 taxa of Asterinaceae; 6 taxa of Schiffnerulaceae and 1 species of fungi from Parodiopsidaceae) are reported here for the first time from the Maharashtra state. The detail morphological description, colour photomicrographs and discussion is provided here only for species new to India, and the taxa newly recorded to Maharashtra state are only listed in study.

MATERIALS AND METHODS

The black mildews infected plant parts were collected from study area during winter (2012-2014) and brought to the laboratory of Dept. of Botany, Krishna Mahavidhyalaya, Shivnagar, Rethare (BK.), India. The host plants were identified using the regional flora [28]. The specimens were air-dried by gentle pressure in blotting papers and preserved in standard size herbarium packets. Both macro and micro-morphological characters are used for taxonomical studies of collected fungi. Microscopic preparations were made in lactophenol as well as in cotton

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Quick Response Code:	Website: www.ijlssr.com
	crossref DOI: 10.21276/ijlssr.2016.2.5.8

blue and observed under compound light microscope. To observe mycelial branching and position of appressoria, a drop of peeling solution (Xylene-Thermocol solution) was applied on selected colonies, and after drying, the film was mounted directly again in the same solution [29]. Biometric data were based on at least 20 measurements of morphological structures. The fungal specimens were identified and their distributional records were checked by using standard literature [1-8, 30-33]. Photomicrographs of microscopic preparations are made under Leica DM2000 fluorescence microscope equipped with digital camera. Identified specimens are deposited in 'Herbarium Cryptogamae Indiae Orientalis' (HCIO), IARI, New Delhi (India) for easy access in future.

RESULTS AND DISCUSSION

Taxonomy

A) New record to India

Meliola litseae Syd. Ann. Mycol. 15: 187. 1917; Hansf. Sydowia Beih. 2: 50, 1961 (Fig. 1).

Colonies amphigenous, dark brown, circular to spreading, thin, confluent, up to 5 mm in diam. Hyphae dark brown, straight to substraight, branching opposite to alternate at wide angles, closely reticulate, wall thick, rough; cells 28–33×7–9 µm in size. Appressoria alternate, moderately placed, antrorse, straight, 24–32×10–16 µm; stalk cells cylindrical to cuneate, straight to curved, 5–9×7–9 µm; head cells oblong, clavate, rarely shallowly lobed, straight to curved, margin entire to crenulate, thick, 19–23×10–16 µm in size. Phialides mixed with appressoria, opposite to alternate, ampulliform, 19–30×7–9 µm in size. Mycelial setae simple, straight to slightly bent, sparsely scattered, aggregated around perithecia, sharply pointed to acute at the tip, up to 645 µm long. Perithecia globose, scattered to grouped at center of colony, verrucose, up to 203 µm in diam. Ascospores oblong to cylindrical, dark brown, 4-septate, constricted at the septa, tapering to rounded at both ends, 40–51×14–19 µm.

Specimen examined: On living leaves of *Litsea josephii* S. M. Almeida (Lauraceae), Gureghar, 17°55'19.2"N, 73°44'22.7"E, elev. 1284 m, 19.10.2012, Bhise M.R., HCIO 51685; HCIO 51684.

Distribution: Formosa, India (Maharashtra), Java, Philippines.

Notes: *Meliola litseae* Syd. was described on *Litsea perrottetii* and *L. glutinosa* from Philippines and further, reported on *L. cubeba*, *L. naronhae*, *L. polyantha* and *L. garciae* from Formosa, Java and Philippines [30]. So far, this species seems to be a most diverse species, and it is represented by 5 different varieties reported from India on species of host genus *Litsea* [1]. However, the present collection matches well with the type species, which was known from Philippines [30] and not reported from India [1-8]. Hence, *M. litseae* is found to be new addition to the

fungi of India and reported here for the first time from India.

This species is found to be associated with *Asterina hosagoudarii* Bhise & Patil and hyperparasitized by hypomycetous fungi.

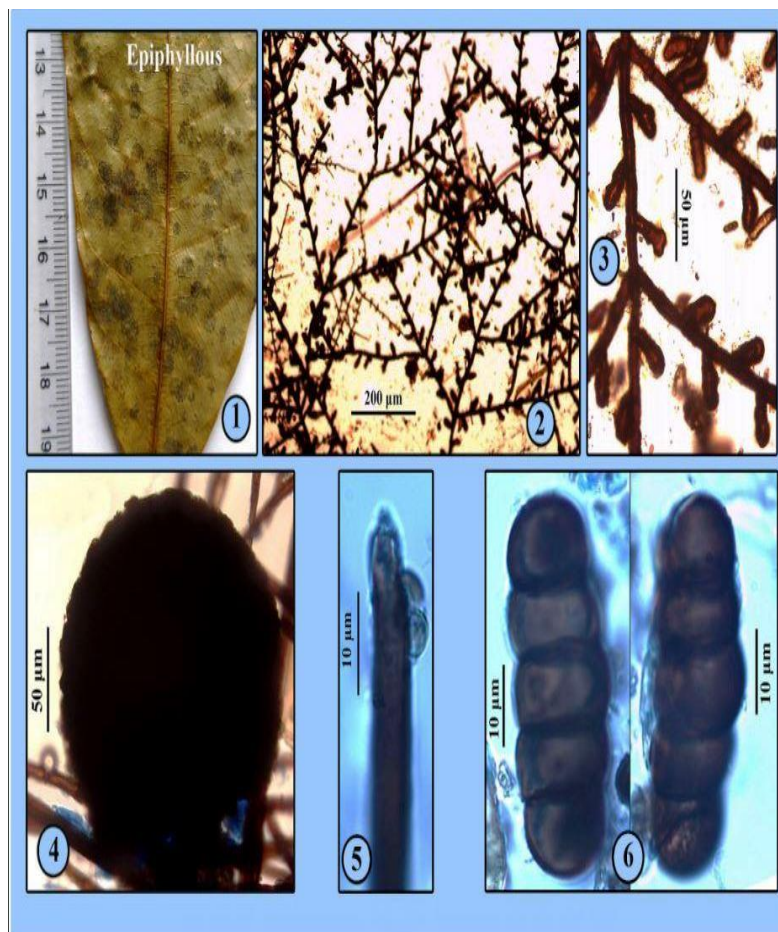


Fig. 1: *Meliola litseae*

1. Infected leaf, 2. Mycelial colony,
3. Appressoriolate mycelium with phialides,
4. Perithecia, 5. Tip of mycelial setae, 6. Ascospores

B) New records to Maharashtra state

A total of 46 taxa of black mildew fungi (of these, 19 taxa of Meliolaceae; 20 taxa of Asterinaceae; 6 taxa of Schiffnerulaceae and 1 taxon of Parodiopsidaceae) are found to be unrecorded from the Maharashtra state and hence reported here for the first time [17-27, 34]. However, concerned to the earlier exploration of black mildews in India, most of these are reported from the Western Ghats region of Kerala, Tamil Nadu and Karnataka states [1-5]. Out of 46 newly recorded fungal taxa for the Maharashtra state, 21 taxa are recorded on new hosts and remaining taxa are found on same host plant (Table 1).

Table 1: List of new records of black mildew fungi to Maharashtra state

S. No	Name of the fungus	Family	Name of the host plant	Locality	Deposition number	Distribution	Remark
1	<i>Armatella litseae</i> (Henn.) Theiss. & Sydow var. <i>boninensis</i> Katumoto & Harada	Armatellaceae	<i>Litsea josephii</i> S.M. Almeida	Pratapgad	HCIO 51709	India (Kerala, Maharashtra), Japan, Australia, Taiwan, China, Philippines	Reported on new host
2	<i>Asteridiella emciciana</i> Hosag., Robin & Archana	Meliolaceae	<i>Scutia myrtina</i> (Burm. f.) Kurz	Gonoshi forest	HCIO 51764	India (Maharashtra, Tamil Nadu)	Reported on same host
3	<i>Asteridiella mallotica</i> (Yamam) Hansf.	Meliolaceae	<i>Mallotus philippensis</i> (Lam.) Muell.-Arg.	Chaturbet	HCIO 51711	Formosa, India (Maharashtra, Tamil Nadu), Philippines	Reported on same host
4	<i>Asteridiella sapotacearum</i> Hansf.	Meliolaceae	<i>Xantolis tomentosa</i> (Roxb.) Raf.	Gonoshi forest	HCIO 51765	Brazil, India (Karnataka, Maharashtra)	Reported on new host, associated with <i>Asterina laxiuscula</i> Sydow and <i>Meliola sideroxyli</i> Stev.
5	<i>Asterina atalantiae</i> Hosag. & Agarwal	Asterinaceae	<i>Atalantia racemosa</i> Wight	Kate's Point	HCIO 51712	India (Kerala, Maharashtra)	Reported on new host
6	<i>Asterina caseariae</i> Hansf.	Asterinaceae	<i>Caesearia graveolens</i> Dalz.	Hatlote	HCIO 51766	China, India (Maharashtra, Uttar Pradesh), Taiwan, Uganda	Reported on new host
				Renoshi forest	HCIO 51767		
7	<i>Asterina chukrasiae</i> Hosag.	Asterinaceae	<i>Aglaiia lawii</i> (Wight) Sald.	Birmanwadi River side	HCIO 51768	India (Kerala, Maharashtra)	Reported on new host
8	<i>Asterina combreti</i> Sydow.	Asterinaceae	<i>Terminalia elliptica</i> Willd.	Par	HCIO 51769	Ghana, Guinea, India (Kerala, Maharashtra), Kenya, South Africa	Reported on same host
				Gonoshi forest	HCIO 51770		
9	<i>Asterina disciferae</i> Hosag.	Asterinaceae	<i>Syzygium caryophyllum</i> (L.) Alst.	Pratapgad	HCIO 51651	India (Maharashtra, Tamil Nadu)	Reported on new host, associated with <i>Asteridiella syzygii</i> Hansf. and <i>Asterina jambolanae</i> Kar & Maity.
				Gonoshi forest	HCIO 51652		
				Gonoshi forest	HCIO 51653		
				Birmani-Bhairijogeshwari	HCIO 51454		
				Dudhoshi	HCIO 51655		
10	<i>Asterina elaeagni</i> (Sydow) Sydow & Petrak	Asterinaceae	<i>Elaeagnus conferta</i> Roxb	Par	HCIO 51771	India (Karnataka, Maharashtra, Tamil Nadu)	Reported on new host
				Gonoshi forest	HCIO 51772		
11	<i>Asterina erysiphoides</i> Kalch. & Cooke	Asterinaceae	<i>Jasminum malabaricum</i> Wight	Par	HCIO 51699	India (Kerala, Karnataka, Maharashtra, Tamil Nadu), South Africa, Uganda.	Associated with <i>Meliola gmellipoda</i> Doidge and <i>Meliola jasmini</i> Hansf. & Stev.
12	<i>Asterina hibisci</i> (Doidge) Hosag.	Asterinaceae	<i>Hibiscus rosa-sinensis</i> L.	Pratapgad	HCIO 51775	India (Kerala, Maharashtra), South Africa	Reported on same host
13	<i>Asterina jambolanae</i> Kar & Maity	Asterinaceae	<i>Syzygium caryophyllum</i> (L.) Alst.	Pratapgad	HCIO 51659	India (Kerala, Karnataka, Maharashtra, Tamil	<i>S. caryophyllum</i> and <i>S. rubicundum</i> are

S. No	Name of the fungus	Family	Name of the host plant	Locality	Deposition number	Distribution	Remark
			<i>Syzygium heyneanum</i> (Duthie) Wall. Ex Gamble var. <i>heyneanum</i>	Chaturbet Forest	HCIO 51661	Nadu, Uttar Pradesh, West Bengal)	new host records
			<i>Syzygium rubicundum</i> Wight & Arn.	Par	HCIO 51662		
14	<i>Asterina litseae</i> Yates	Asterinaceae	<i>Litsea deccanensis</i> Gamble	Chaturbet	HCIO 51716	India (Maharashtra, Tamil Nadu, Uttar Pradesh), Philippines	Reported on same host
15	<i>Asterina lobulifera</i> Sydow	Asterinaceae	<i>Glochidion ellipticum</i> Wight	Birmani	HCIO 51717	China, India (Kerala, Maharashtra), Japan, Philippine, Taiwan	Reported on same host
16	<i>Asterina morellae</i> Hosag., C.K. Biju & Abraham	Asterinaceae	<i>Garcinia indica</i> (Du Petit-Thou.) Choisy	Pratapgad	HCIO 51779	India (Kerala, Maharashtra)	Reported on new host
17	<i>Asterina piperina</i> Sydow	Asterinaceae	<i>Piper trichostachyon</i> (Miq.) C.B.Cl.	Ghonaspur	HCIO 51720	China, India (Kerala, Karnataka, Maharashtra), Malaysia, Philippine, Taiwan	Reported on new host, associated with <i>Meliola stenospora</i> Wint. var. <i>major</i> Hansf.
18	<i>Asterina rhamni</i> Kar & Ghosh	Asterinaceae	<i>Ventilago maderaspatana</i> Gaertn.	Hatlote	HCIO 51722	India (Maharashtra, West Bengal)	Reported on new host
19	<i>Asterina tertia</i> Racib.	Asterinaceae	<i>Rhinacanthus nasuta</i> (L.) Kurz	Ambenahat	HCIO 51723	Colombia, India (Kerala, Karnataka, Maharashtra, Tamil Nadu), Indonesia, South Africa	Reported on same host
			<i>Asystasia dalzelliana</i> Sant.	Pratapgad	HCIO 51724		
20	<i>Asterina trichiliae</i> Doidge.	Asterinaceae	<i>Trichilia connaroides</i> (Wight & Arn.) Benth.	Pratapgad	HCIO 51782	India (Maharashtra, Tamil Nadu), Ghana, South Africa	Reported on same host
21	<i>Asterina wingfieldii</i> Hosag., Balakr. & Goos	Asterinaceae	<i>Grewia abutilifolia</i> Vent. ex A. Juss.	Gonoshi	HCIO 51783	India (Maharashtra, Tamil Nadu)	Reported on new host
			<i>Grewia serrulata</i> DC.	Hatlote	HCIO 51784		
22	<i>Asterina wrightiae</i> Sydow	Asterinaceae	<i>Wrightia tinctoria</i> R. Br.	Kharoshi	HCIO 51726	India (Kerala, Maharashtra), Philippines	Associated with <i>Sarcinella wrightiae</i>
23	<i>Asterostomella flacourtiiae-montanae</i> Hosag.	Asterinaceae	<i>Flacourtia indica</i> (Burm. f.) Merr.	Machutar-Tetawali	HCIO 51785	India (Kerala, Maharashtra)	Reported on same host
24	<i>Asterostomula pavettae</i> Hosag. & Sabeena	Asterinaceae	<i>Pavetta concanica</i> Bremek.	Par-Wada	HCIO 51786	India (Kerala, Maharashtra)	This is the only species known on <i>Pavetta</i>
25	<i>Balladynopsis negrii</i> (Cast.) M.B. Ellis	Parodiopsisaceae	<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	Mahabaleshwar	HCIO 51701	India (Madhya Pradesh, Maharashtra)	Reported on same host
26	<i>Irenopsis leae</i> Hansf. var. <i>javensis</i> Hansf.	Meliolaceae	<i>Cissus elongata</i> Roxb.	Par	HCIO 51789	India (Maharashtra, Tamil Nadu)	Reported on same host
27	<i>Meliola bataanensis</i> Sydow & Sydow	Meliolaceae	<i>Paracalyx scariosus</i> (Roxb.) Ali	Renoshi	HCIO 51729	India (Kerala, Maharashtra), Philippines	Reported on new host
28	<i>Meliola caesalpiniicola</i> Deighton	Meliolaceae	<i>Caesalpinia cucullata</i> Roxb.	Old Mahabaleshwar	HCIO 51731	India (Kerala, Maharashtra), Philippines	Reported on new host
29	<i>Meliola capensis</i>	Meliolaceae	<i>Allophylus cobbe</i> (L.)	Chaturbet	HCIO 51732	India (Maharashtra,	Reported on

S. No	Name of the fungus	Family	Name of the host plant	Locality	Deposition number	Distribution	Remark
	(Kalch. & Cooke) Theiss var. <i>allophylicola</i> Hansf & Deight.		Raeusch.			West Bengal), Gold Coast	same host
30	<i>Meliola careyae</i> (Stev.) Hosag. var. <i>indica</i> Hosag.	Meliolaceae	<i>Careya arborea</i> Roxb.	Birmani	HCIO 51793	India (Kerala, Maharashtra)	Reported on same host
31	<i>Meliola commixta</i> Sydow	Meliolaceae	<i>Dimocarpus longan</i> Lour.	Pratapgad	HCIO 51735	India (Kerala, Maharashtra), Philippines	Reported on same host
32	<i>Meliola cookeana</i> Speg.	Meliolaceae	<i>Vitex leucoxylon</i> L. f.	Kasurde	HCIO 51736	India (Karnataka, Maharashtra), Congo Belge, Florida, Formosa, Java, Philippines, Sierra Leone	Reported on same host
33	<i>Meliola cookeana</i> Speg. var. <i>viticis</i> (Hansf.) Hansf.	Meliolaceae	<i>Clerodendrum serratum</i> (L.) Moon.	Hatlote	HCIO 51734	India (Kerala, Maharashtra), Indonesia, Java, Malaysia, Taiwan, Uganda	Reported on same host
34	<i>Meliola gemellipoda</i> Doidge	Meliolaceae	<i>Jasminum malabaricum</i> Wight	Bamnoli	HCIO 51681	Congo Belge, Gold Coast, India (Karnataka, Kerala, Tamil Nadu, Maharashtra), Malaya, Sierra Leone, South Africa, Tanganyika	Associated with <i>Meliola jasmini</i> Hansf. & Stev. and <i>Asterina erysiphoides</i> Kalch. & Cooke
35	<i>Meliola jasmini</i> Hansf. & Stev.	Meliolaceae	<i>Jasminum malabaricum</i> Wight	Wilson point	HCIO 51683	Gold Coast, India (Kerala, Maharashtra), Malaya, Sierra Leone, Uganda	Reported on new host, associated with <i>Meliola gemellipoda</i> Doidge and <i>Asterina erysiphoides</i> Kalch. & Cooke
36	<i>Meliola longiseta</i> Hoehnel	Meliolaceae	<i>Canthium dicoccum</i> (Gaertn.) Teijsm. & Binn. var. <i>umbellatum</i> (Wight) Sant. & Merch.	Par-Wada	HCIO 51675	India (Karnataka, Maharashtra), Samoa	Associated with <i>Meliola plectroniae</i> Hansf.
37	<i>Meliola oleicola</i> Doidge	Meliolaceae	<i>Olea dioica</i> Roxb.	Birmanwadi road	HCIO 51689	India (Kerala, Maharashtra), Philippines	Reported on new host
38	<i>Meliola psychotriae</i> Earle	Meliolaceae	<i>Oxyceros rugulosus</i> (Thw.) Tirveng.	Mahabaleshwar	HCIO 51800	Borneo, Brazil, Congo Belge, Ecuador, India (Kerala, Maharashtra), Java, Philippines, Porto Rico, San Domingo, Sierra Leone, Uganda,	Reported on new host
39	<i>Meliola ramosii</i> Sydow & Sydow	Meliolaceae	<i>Homonoia riparia</i> Lour.	Kasurde	HCIO 51746	India (Karnataka, Kerala, Maharashtra), Philippines	Reported on same host
40	<i>Meliola wendlandiae</i> Hosag.	Meliolaceae	<i>Wendlandia thyrsoides</i> (R. & S.) Steud.	Pratapgad	HCIO 51752	India (Karnataka, Kerala, Maharashtra, Tamil Nadu)	Reported on same host

S. No	Name of the fungus	Family	Name of the host plant	Locality	Deposition number	Distribution	Remark
41	<i>Sarcinella glycosmidis</i> Kamal & Singh	Schiffnerulaceae	<i>Paramignya monophylla</i> Wight	Ambenahat	HCIO 51697	India (Maharashtra, Uttar Pradesh), Mexico	Reported on new host
			<i>Murraya paniculata</i> (L.) Jack	Ambenahat	HCIO 51755		
42	<i>Sarcinella latifoliae</i> Srivatava, Chandra & Gupta	Schiffnerulaceae	<i>Cissus elongata</i> Roxb.	Wilson point	HCIO 51803	India (Maharashtra, Uttar Pradesh)	Reported on new host
43	<i>Sarcinella wrightiae</i> Hosag., Archana & Agarwal	Schiffnerulaceae	<i>Wrightia tinctoria</i> R. Br.	Kharoshi	HCIO 51758	India (Kerala, Maharashtra)	Associated with <i>Asterina wrightiae</i> Sydow
44	<i>Schiffnerula canthii</i> Hosag. & Archana (<i>Sarcinella</i> sp.)	Schiffnerulaceae	<i>Meyna laxiflora</i> Robyns	Birmanwadi	HCIO 51756	India (Kerala, Maharashtra)	Reported on new host
45	<i>Schiffnerula flacourtiiae</i> Hosag. & Jacob. (<i>Sarcinella manilensis</i> (Sacc.) Kranz.)	Schiffnerulaceae	<i>Flacourtia montana</i> Grah.	Chaturbet	HCIO 51805	Guinea, India (Kerala, Madhya Pradesh, Maharashtra), Venezuela	Reported on same host
46	<i>Schiffnerula glochidii</i> Hosag. (<i>Sarcinella glochidii</i> Hosag.)	Schiffnerulaceae	<i>Glochidion ellipticum</i> Wight	Kate's Point	HCIO 51759	India (Karnataka, Kerala, Maharashtra)	Reported on new host

ACKNOWLEDGMENT

The authors are grateful to authorities of Maharashtra State Biodiversity Board, Nagpur (M.S.) for granting permission for collection of plant material from study area. Thanks to Prof. S. R. Yadav and Dr. M. M. Lekhak, Dept. of Botany, Shivaji University, Kolhapur for providing the photo-micrography facility; Principal, D.K.A.S.C. College, Ichalkaranji and Principal, Krishna Mahavidyalaya, Shivnagar, Rethare (BK.), Dist. Satara, for providing laboratory facilities and Principal, L.K.D.K. Banmeru Science College, Lonar for the encouragement.

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Source of Financial Support: Nil

Conflict of interest: Nil

International Journal of Life-Sciences Scientific Research (IJLSSR)

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