

Modern pollen spectra from Chamrajnagar District of Karnataka, India

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ABSTRACT

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A study on modern pollen rain from the Chamrajnagar District of Karnataka has been documented. The pollen study revealed the dominance of nonarboreals over arboreals. Among the arboreals, *Syzygium*, *Eucalyptus*, Meliaceae and Rutaceae are commonly represented taxa in the area. However, among nonarboreals grasses are predominant along with other typical associates namely, Tubuliflorae, Liguliflorae, *Mimosa* and Euphorbiaceae. The abundance of marshy taxa, viz. Cyperaceae, Polygonaceae and Onagraceae are indicative of the water logged condition in and around the area. The steady presence of cereals along with other cultural pollen, like Chenopodiaceae and Lamiaceae is strongly suggestive of the arable activity in the area. The occurrence of degraded pollen–spore along with adequate fungal elements especially *Meliola*, Microthyriaceae and *Glomus* is suggestive of aerobic microbial digenesis of rich organic debris during sedimentation. The studied palynodata will be helpful for the precise palaeoecological study in and around the study area.

Key-words—Kollegal, Human activity, Palaeoecological study, Palynoassemblage.

भारत में कर्नाटक के चामराजनगर जिले से प्राप्त आधुनिक पराग स्पैक्ट्रा

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सारांश

कर्नाटक के चामराजनगर जिले से प्राप्त आधुनिक पराग वर्षा का अध्ययन प्रलेखित किया गया है। पराग अध्ययन से वृक्षीयों पर गैर-वृक्षीयों की प्रभाविता का पता चला। क्षेत्र में वृक्षीयों में से सायजीजियम, यूकेलिप्टस, मिलीएसी एवं रुटेसी सामान्यतः मिलने वाली टैक्सा हैं। फिर भी, गैर-वृक्षीय घासों में से अन्य प्ररूपी सहयोगियों नामतः टुबुलीफ्लोरे, लिगुलीफ्लोरे, मिमोसा एवं यूफोर्बीएसी के साथ पूर्व प्रभावी हैं। कच्छ टैक्सा अर्थात् साइपिरेसी, पॉलीगोनैसी एवं ओनाग्रेसी की बहुलता क्षेत्र में एवं चहुंओर जलाक्रांत स्थिति की द्योतक हैं। अन्य संवर्धित पराग जैसे चीनोपोडीएसी एवं लैमिएसी के साथ अनाज की स्थायी विद्यमानता क्षेत्र में कृष्य सक्रियता की दृढ़ता से सुझावित है। पर्याप्त कवक तत्वों विशेषतः *मेलिओला*, माइक्रोथाइरिडिआ एवं *ग्लोमस* के साथ निम्नीकृत पराग/बीजाणु की प्राप्ति अवसादन के दौरान प्रचुर कार्बनिक मलबा के वायुजीवी सूक्ष्मजैविक पीढ़ी एकांतरण को सुझावित है। अध्ययन किया गया परागाणु आंकड़ा अध्ययनीय क्षेत्र में और चहुंओर संक्षिप्त पुरापास्थितिकीय अध्ययन के लिए मददगार होगा।

सूचक शब्द कोल्लेगल, मानवसक्रियता, पुरापास्थितिकीय अध्ययन, परागाणुसमुच्चय।

INTRODUCTION

IN south India though extensive works have been carried out by many workers (Menon, 1968; Vishnu–Mittre & Gupta, 1970; Gupta, 1973; Caratini *et al.*, 1973, 1991; Gupta & Prasad, 1985; Vasanthy, 1988; Bera & Gupta, 1992; Gupta & Bera, 1996; Bera *et al.*, 1996, 1997; Bera, 1999; Bonnefille

et al., 1999; Bera & Farooqui, 2000; Anupama *et al.*, 2000; Barboni & Bonnefille, 2001; Barboni *et al.*, 2003; Farooqui *et al.*, 2010), but no work has been recorded on modern pollen rain in Chamrajnagar District of Karnataka. However, earlier a palynological study on honey sample has been carried out from the Gundal Dam and Biligirirangaswamy area from the Chamrajnagar District (Chauhan & Murthy, 2010).

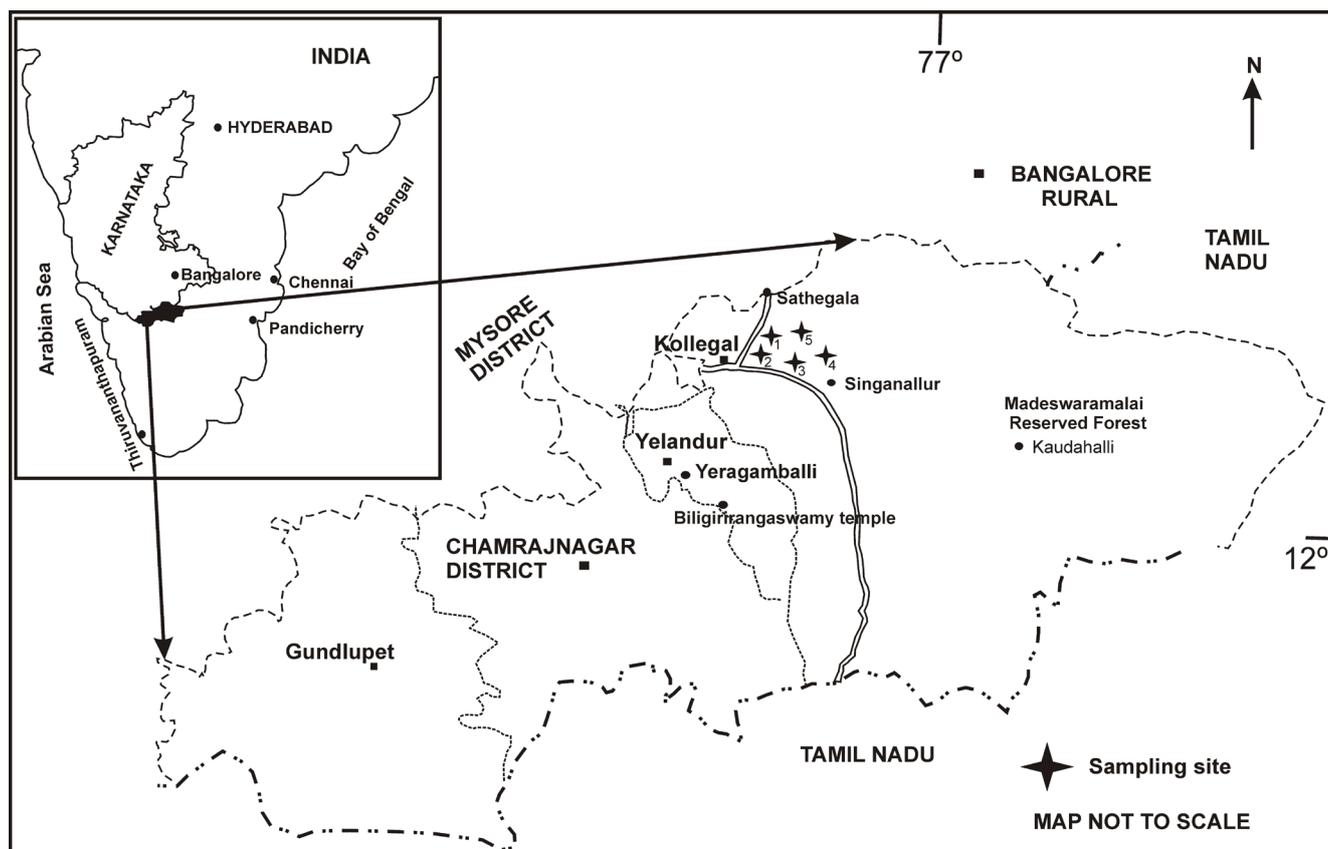


Fig. 1—Location map showing the study area.

The Kollegal area is lying between $12^{\circ}15'N$ and $77^{\circ}12'E$ and 25 km towards east from the Chamrajnagar (District Headquarters) (Fig. 1). Therefore, the first initial attempt has been taken to trace the modern pollen and vegetation relationship in the area which will be helpful for precise interpretation for palaeoclimate study through the pollen diagram in time and space.

VEGETATION

The vegetation of study area is openland consisting of scattered trees, namely *Syzygium cumuni*, *Salmalia malabaricum*, *Butea monosperma*, *Santalum album*, *Terminalia bellerica*, *Eucalyptus* sp., *Caesalpinia* sp. and *Moringa oleifera*. The ground vegetation is dominated by grasses interspersed with Cyperaceae, *Justicia simplex*, *Mimosa pudica*, Onagraceae and Polygonaceae.

CLIMATE AND SOIL

The climate of the area is fairly hot during summer and moderate in winter. The maximum temperature reaches up to $34^{\circ}C$ during summer and minimum upto $15.4^{\circ}C$ during winter. However, the relative humidity ranges from 68 to 85%. The

soil is generally reddish in colour and admixture of sand and silt due to low organic matters.

MATERIAL AND METHODS

Five surface soil samples (K1–K5) were procured randomly from Kollegal openland area. The samples were processed employing standard acetolysis method (Erdtman, 1953). The procured samples were treated with 10% aqueous KOH solution to deflocculate the pollen/spore from the sediments followed by 40% HF treatment to dissolve silica content. Thereafter, the conventional procedure of acetolysis was followed using acetolysis mixture (9: 1 acetic anhydride and conc. H_2SO_4). Finally the material was kept in 50% glycerin solution. A few drops of phenol were also added to the glycerin solution to protect the maceral from microbial decomposition. 170 to 210 pollen and spore per sample were counted to make pollen spectra. Plant elements in the studied samples have been categorized into arboreals (trees and shrubs), nonarboreals (terrestrial herbs and marshy) and fungal remains. For the precise identification of fossil palynomorphs in the sediments, the reference pollen slides available at Birbal Sahni Institute of Palaeobotany (BSIP) Herbarium as well as the pollen photographs in the published literature (Chauhan & Bera, 1990; Bera *et al.*, 2009) were

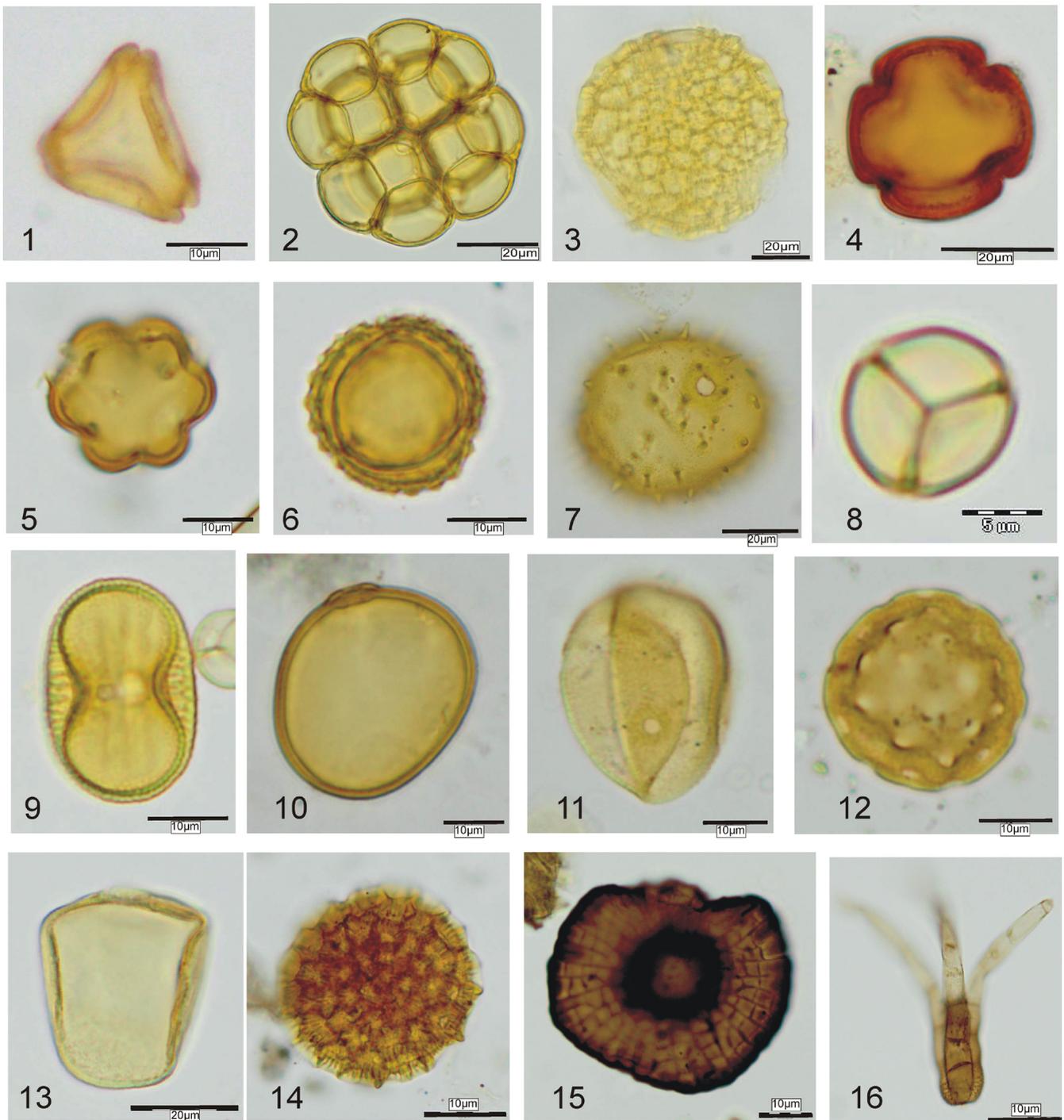


PLATE 1

Palynoassemblage recovered in the surface sample from Kollegal area, Karnataka, India.

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|----|------------------------|-----|----------------------|
| 1. | <i>Syzygium</i> sp. | 9. | <i>Justicia</i> sp. |
| 2. | <i>Acacia</i> sp. | 10. | Poaceae |
| 3. | <i>Caesalpinia</i> sp. | 11. | Cereal |
| 4. | Meliaceae | 12. | Chenopodiaceae |
| 5. | Combretaceae | 13. | Cyperaceae |
| 6. | Tubuliflorae | 14. | Polygonaceae |
| 7. | Malvaceae | 15. | Microthyriaceae |
| 8. | <i>Mimosa pudica</i> | 16. | <i>Tetraploa</i> sp. |

consulted and photodocumentation was made using Olympus BX-61 microscope with DP25 Digital Camera under 40X magnification (Pl. 1). The pollen spectra were made using Microsoft Excel program and modified in Corel Draw-12 software.

RESULTS

Pollen spectra

K1-K5: The overall palynodata reveal that the nonarboreal taxa (65%) are over dominant in contrast to the arboreal taxa (28%) and fungal remains (7%) respectively (Fig. 2). The major arboreal taxa recovered from the sediments are *Syzygium cumunii*, *Eucalyptus*, Meliaceae, Combretaceae, Rutaceae and *Lantana* within the range of 1-6%. The nonarboreal taxa, namely Poaceae (non-cereal) is dominant (23%), the other associates such as Tubuliflorae, Liguliflorae, Malvaceae, *Mimosa pudica* and *Justicia simplex* also recorded within the value of 3-8%. However, the marshy taxa, like Cyperaceae, Onagraceae and Polygonaceae are represented within the value of 1-6%. The cereal pollen is recorded within the value of 6-8%. However, the other cultural pollen, namely Chenopodiaceae, Lamiaceae and Caryophyllaceae are also recorded within the range of 1-4%. The fungal remains such as Microthyriaceae, *Meliola*, *Alternaria* and *Helminthosporium* are represented within the value of 5-7% in the palynoassemblage of the study area.

DISCUSSION AND CONCLUSIONS

The overall palynoassemblage data recovered from the studied samples reveals the existence of open land vegetation under warm and humid climatic condition. However, the palynodata is partially match the extant vegetation in the study area. This is important to note that *Santalum album*, a main ingredient is not represented in the palynoassemblage which is growing luxuriantly in and around the area need further study. Although the reasons may be due to the poor preservation because of low sporopollenin contain and the entomophily in nature. However, the microbial activity during sedimentation as evidenced by the adequate presence of fungal spore along with a few degraded palynomorphs in the palynoassemblage may also affect the preservation of microbiota. The representation of Cyperaceae, Onagraceae and Polygonaceae is suggestive of the marshy as well as water logged condition of the area. The consistent presence of Euphorbiaceae in the palynoassemblage is significant and suggestive of the good monsoonal activity in the area. The occurrence of fungal remains especially Microthyriaceae, *Meliola* and *Tetraploa* are suggestive of the humid depositional condition during sedimentation. However, the recovery of the common parasitic fungi of grasses and other herbaceous plants such as *Helminthosporium*, Teliospore and *Alternaria* are indicative of luxuriant growth of herbaceous vegetation in the area. The cereal pollen along with other cultural pollen like Caryophyllaceae, Lamiaceae and Chenopodiaceae are

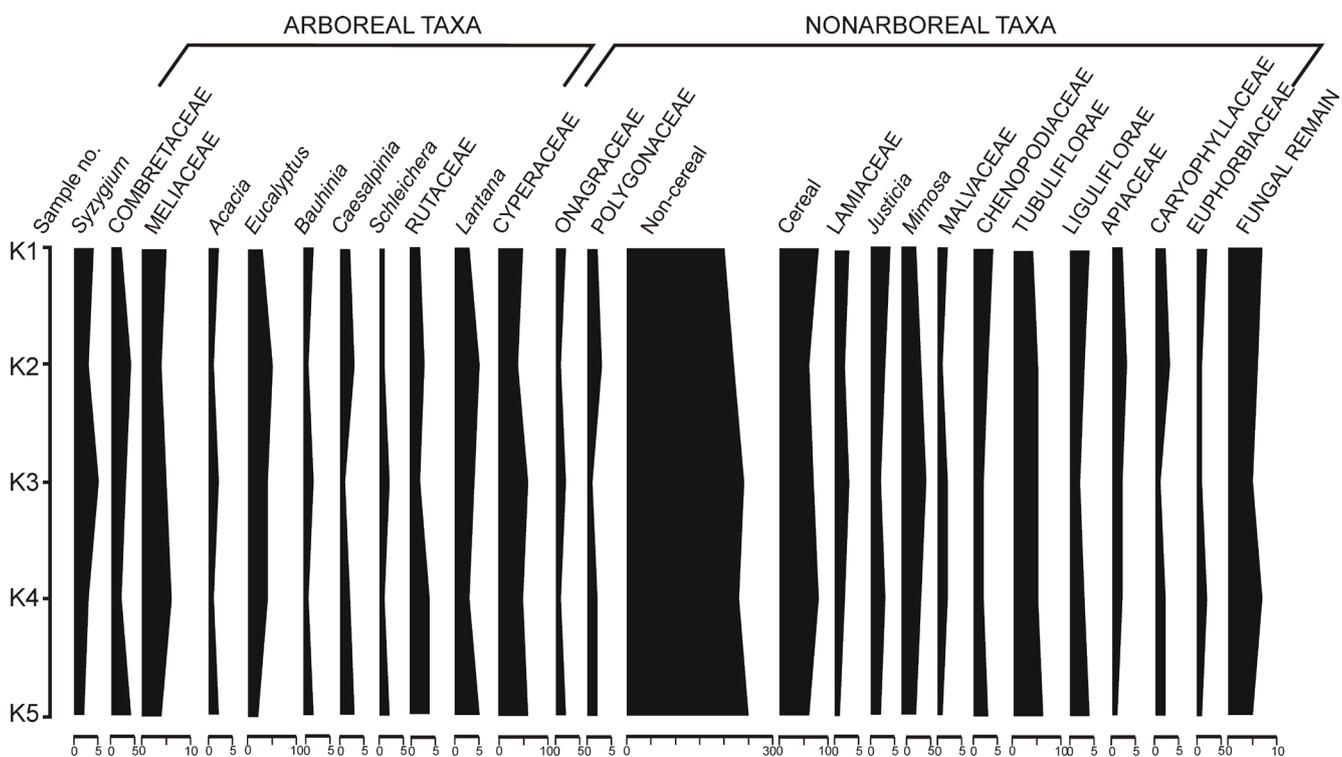


Fig. 2—Pollen spectra from the Kollegal area, Karnataka, India.

strongly suggestive of the pastoral activities in and around the study area. The consistent presence of *Mimosa pudica* pollen is strongly indicative of the openland vegetation in the area. In conclusion, the maiden attempt of palynological study although in small sample size, the pollen baseline data will be helpful for future palaeoecological study through the pollen diagram in time and space.

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