

Red Sanders as a Stratigraphic Guide in The Correlation of The Cuddapah Formations



Engineering

KEYWORDS : Quartzites, Cuddapah Formations, Stratigraphic guide, Red sanders

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ABSTRACT

From the studies carried out by the authors in Collaboration with the Geological Survey of India and State Forest Department, it is observed that the natural distribution of Red Sander plant (Pterocarpus santalinus Linn. f.) is almost wholly confined in the entire world to the tropical dry deciduous forests in the Palakonda, Velikonda and Lankamalai hill ranges, which lie between 13°30' and 15°0' north latitudes and 78°45' 79°30' east longitudes in Chittoor, Cuddapah and Nellore Districts of Andhra Pradesh state in South India and comprise essentially of Nagari Quartzites, Cumbum Shales and Quartzites, Irlakonda Quartzites, Pullampet Quartzites and Shales and Bairenkonda quartzites of Cuddapah Supergroup of proterozoic era. From its restricted geographical and geological distribution, it is suggested that Red Sanders could be used as a stratigraphic guide to recognize a group within the Cuddapah Super group. While agreeing with the latest classification of the Cuddapah Supergroup by the Geological Survey of India that the Cuddapah Supergroup consists of the Papaghni, Chitravathi and Nallamalai Groups, a case has been made out to include all the geological formations supporting the growth of Red Sander under the Cheyair Group a term abandoned in the latest classification of the Geological Survey of India, and fix its stratigraphic position between Chitravathi and Nallamalai Groups.

INTRODUCTION

Red Sander (Pterocarpus santalinus Linn.f.) is a valuable forest product, whose natural distribution is almost wholly confined in the entire world to a restricted area of about 2 lakh hectares, between 13°30' and 15°0' north latitudes and 78°45' and 79°30' east longitudes, in the tropical dry deciduous forests in Chittoor, Cuddapah and Nellore Districts in the south eastern part of Andhra Pradesh State in south India. Detailed studies have been carried out in collaboration with the State Forest Department and the Geological Survey of India on the geobotany and biogeochemistry of Red Sander. This species occurs essentially in the forests along the Palakonda, Lankamalai and the southeastern tip of the Nallamalai hill ranges, extending in a northwestern direction and in the forests along the Valikonda hill ranges extending in a northern direction, with both the hill ranges merging at a place a little north of Tirupati town. Its growth is favoured by a hilly terrain with moderate to steep sloped and covered with very shallow to shallow sandy loam, which is brown in colour, free of humus, friable in nature and mixed with quartzite boulders.

USE OF RED SANDER AS A STRATIGRAPHIC GUIDE

The restricted distribution of Red Sander within a very large track in South India indicates its possible use as a geobotanical indicator. Geobotanical indicators have been used in locating and mapping groundwater, Saline deposits, hydrocarbons, rock types and ores (Hawkes and Webb, 1962). The restricted occurrence of this species to areas covered by Quartzite and shale suggests that this species could be used as a geobotanical indicator of those rock types. But, the restricted geographical occurrence of this species to quartzite and shale of the Cuddapah Supergroup and Kurnool Group of Proterozoic era, having more or less the same physiographical and climatological environment, it is suggested that Red Sander could be better used as stratigraphic guide in the correlation of the Cuddapah formations.

DISTRIBUTION OF RED SANDERS

The distribution of Red Sander within Cuddapah basin is confined to its southeast portion and is practically absent in the rest of the basin. Its distribution is shown in figure 1 and in table 1.

TABLE 1 : Distribution of Red Sander in the Geological formations of the Cuddapah Super Group

S. No.	Formation	Area in km ²	% distribution
1.	Nagari quartzite	891.8	46.9
2.	Cumbum Shale	272.4	14.3
3.	Irlakonda quartzite	257.0	13.5
4.	Bairenkonda quartzite	149.1	7.8
5.	Cumbum quartzite	120.8	6.4

6.	Pullampet quartzite	95.1	5.0
7.	Pullampet shale	74.5	3.9
8.	Gulcheru quartzite	41.1	2.2

The species in its natural distribution is practically absent in other Cuddapah formations. It is, however, found sparingly in the Kambakam, Nagalapuram, Nagari and Srikalahastri reserved forests occupied by outliers of Nagari Quartzite, separated by the main Cuddapah basin by granitic rocks of Archaean era.

CLASSIFICATION OF THE CUDDAPAH SUPERGROUP

The crescent mid-proterozoic cuddapah basin of peninsular India consists mainly of orthoquartzite-carbonate suite and basic to acid volcanics and sills in the lower part, and siliceous shales with quartzites in the upper part. It has a concave eastern margin 440km long, with a maximal basinal width of 145km in the middle, covering an area of 44,500km and containing over 12km of sediments and volcanic.

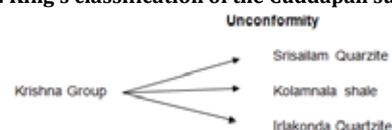
The western margin is marked by a profound non-conformity of cuddapah sediments resting on the Archaean peninsular gneissic complex enclosing greenstone belts of kadiri, veligallu and gadwal. The litho stratigraphy of cuddapah basin is formalized in terms of cuddapah super group and Kurnool group. The cuddapah super group is predominantly arenaceous to argillaceous with subordinate calcareous to dolamitic thrusting related to the eastern ghat orogeny. The basin has become the focus of increased attention in recent years.

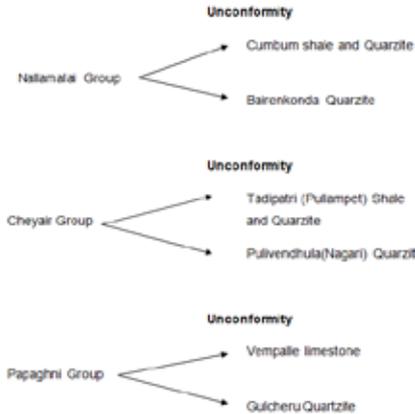
Recent studies by officers of the geological survey of India have led to litho stratigraphy revision of the classical work of king (1872). This has also provided a modern framework for rapidly growing studies in geophysical, petrological and economical aspects.

Lithologically the cuddapah supergroup is predominantly argillaceous and arenaceous sequence with subordinate calcareous sediments characteristically each group starts with Quartzite and ends with dolamitic or shale/phyllite. the volcanic and hypabyssal rocks of the cuddapah supergroup are described under the section on "igneous activity"

Table 2 gives the classification of the Cuddapah Supergroup of rocks, which is modified slightly from that given by king (1872).

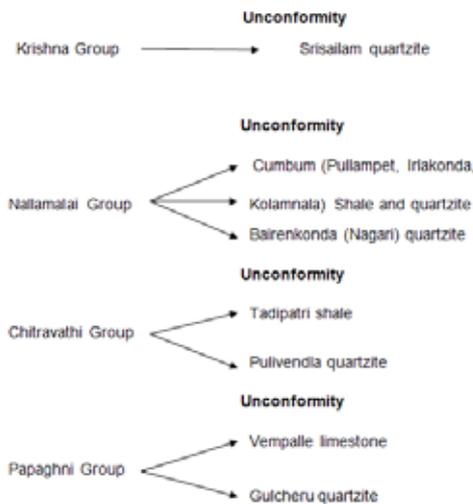
TABLE 2: King's classification of the Cuddapah supergroup





Based on detailed work done for over a century, the Geological Survey of India (Murthy et al., 1978; Krishnaswamy, 1978, 1981) has revised the king's four-fold classification of the Cuddapah Supergroup to a three-fold classification, as shown in table 3. As per this revised classification, the table 3, Pulivendla-Tadipattri formations are considered to be not homotaxial to the Nagari-Pullampet formations and are included under the Chitravathi group, a term derived from the name of the river traversing the Nagari-Pullampet formation, is dropped. As the unconformity noted by king (1872) between the Nagari-Pullampet formations and the Bairenkonda-Cumbum formations could not be established, they are all included under the Nallamalalai Group. The term Krishna Group is dropped by considering Irlakonda Quartzites as a lateral lithofacies variation of the Cumbum (Pullampet) Shale and Kolamnala Shale as homotaxial to the Cumbum Shale.

TABLE 3 : Revised classification of the Cuddapah supergroup



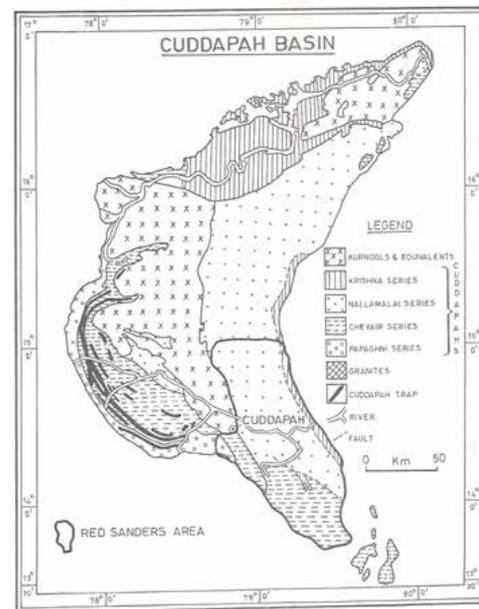
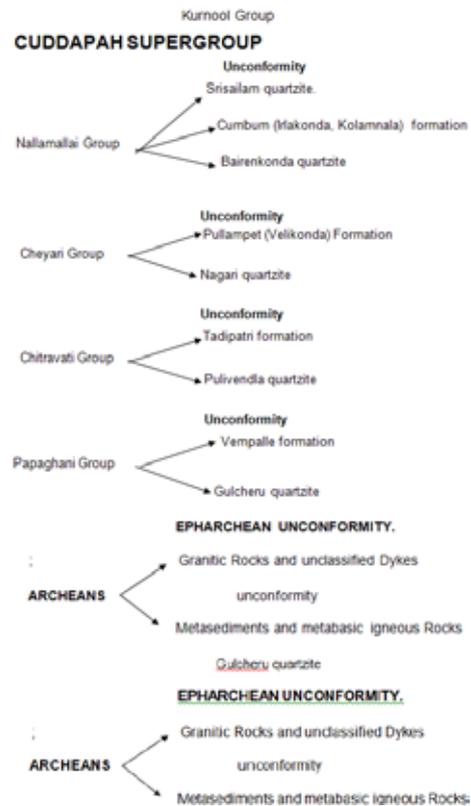
DISCUSSION

The presence of Red Sander in the Nagari-Pullampet formations, but not in the Pulivendla formations, supports the revised classification that they are not homotaxial. The presence of Red Sander in the Nagari-Pullampet formations as well as in the Bairenkonda-Cumcum formations and the Irlakonda Quartzite in the south eastern Cuddapah Basin supports the revised view that they are homotaxial.

As per the revised classification the entire quartzite-shale formations occurring all along te eastern portion of the Cuddapah Basin for a length of about 360 km, which includes the Nagari-Pullampet, Bairenkonda-Cumbum and Irlakonda-Kolamnala formations, belong to the Nallamalalai Group. But it is noted that Red Sander is endemic in the southern part of the Nallamalalai Group and is absent in the northern part. Based on this observation, the authors find it justified in including all those forma-

tions of the Nallamalalai Group carrying Red Sander, viz., the Nagari-Pullampet formations of the original Cheyair Group (a term dropped in the revised classification), portions of the Bairenkonda-Cumbum formations in the palakonda, Erramalalai and south eastern tip of the Nallamalalai hill ranges and the Irlakonda Quartzite in the Velikonda hill ranges under the new Cheyair Group. The Bairenkonda formations supporting Red Sander are called Nagari formations, the Cumbum formations supporting Red Sander are called Pullampet formations and the Irlakonda Quartzite supporting Red Sander are called Valikonda Quartzite. Keeping in conformity with the king's classification, the new Cheyair Group is treated as younger to the Chitravathi Group, but older to the Nallamalalai Group. The authors' classification of the Cuddapah Supergroup is given in table 4.

TABLE 4 : Revised classification of the Cuddapah supergroup based on the distribution of Red Sander



Apart from Red Sander, other factors that support the proposed classification are listed below.

1. The Cheyair formation are structurally less disturbed and strike essentially in a north-northwest direction, while the Nallamalai formations are structurally more disturbed and strike essentially in a north-northeast direction.
2. The Cheyair formations are not subjected to metamorphism, while the Nallamalai formations are subjected to low-grade metamorphism and contain essentially slates and occasionally phyllites, schists and fine-grained micaceous limestones.
3. Intrusive felsic rocks like granites and pegmatite are found in the Nallamalai formations, but not in the Cheyair formation.

The dividing line between the Cheyair and Nallamalai Groups can be taken to roughly coincide with the 15° north latitude. In the classification proposed, the only anomaly noted relates to the occurrence of Red Sander in about 41 km² of area occupied by the Gulcheru Quartzite of the Papagani Group. Reconnaissance surveys indicated that the rest of the Gulcheru Quartzite and the entire Vempalle formations are practically devoid of Red Sander. The occurrence of Red Sander in a small area within the

Gulcheru Quartzite may be because of their close proximity with the Nagari Quartzites. From this, it is concluded that, although from the distribution of Red Sander, the Cheyair Group has been broadly recognized.

Red Sander is also found on a minor scale in the forests of the hill ranges of Kambakam, Nagapuram, Nagari and Srikalahasti, which comprises of outcrops of quartzite within Archaean granitic rocks of Chittoor District. From the occurrence of Red Sander, it is concluded that this quartzite should be included under the Nagari Quartzite of the Cheyair Group.

CONCLUSION

The usefulness of Red Sander Plant as a stratigraphic guide in the classification of the Cuddapah Supergroup is stressed. The Nallamalai Group, as per the revised classification of the Geological Survey of India, is divided into an older Cheyair Group, consisting of Red Sander, and a younger Nallamalai Group, devoid of Red Sander, is proposed.

ACKNOWLEDGEMENTS:

Thanks are due to the officials of the Forest Department of Government of Andhra Pradesh in Providing necessary data and facilities to carry out this work.

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