Calvin *et al.*[7] that the plot of Log K_1 K_2 of the above bivalent metal ion-ferron chelates against the second ionisation potential of the metal ions yields a straight line with the exception of Zn^{+2}. Further, the data reveal the fact that as the basicity of the ligand decreases in the order of ferron < 8-hydroxy quinoline 5-sulphonic acid < 8-hydroxy quinoline, the values of stability constants also correspondingly decrease. Thus the lower basicity of the ligand is reflected in a correspondingly lower stability of the metal chelates of ferron.

Further details of these investigations will be published subsequently.

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A GRAPHIC APPROACH IN PALAEOMAGNETIC ANALYSIS

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IN studies in structural petrology the use of equal-density contour lines has long been familiar. Density diagrams thus prepared on the basis of a scatter-diagram in which the individual observations are plotted on a stereographic projection (Wulff net) or on an area true projection (Lambert's equal area projection commonly known as Schmidt net) render it easy to visualize fully the pattern of dispersion of the observations.[1] A similar application can as well be extended to the treatment of the palæomagnetic directions.

The basis of palæomagnetism is that the magnetic vector in a rock is directionally oriented and this direction carries the magnetic history of the rock itself. The basic factors determined in palæomagnetic studies are, therefore, the declination and the inclination values. Since this datum is three-dimensional it is customarily presented in a two-dimensional form by making use of a Wulff net or a Schmidt net. On this net unit vectors representing the individual directions are plotted, no weight being given to the varying intensity of magnetisation values. A 'pole diagram' is thus prepared. While a close grouping of these point-projertions of the palæomagnetic directions obtained from the same hierarchical level is always indicative of the reliability of the observations these directions never agree exactly. Instead, a cluster of directions is normally observed. This means that in palæomagnetic studies, as in structural petrology, a scatter of observations projected as points on the net in the form of a pole diagram is encountered. The distribution of the individual points in the pole diagram and their dispersion about the mean value, therefore, need to be summarised by some means in order to evaluate a clear picture of the dispersion trends.

Customarily the palæomagnetic data obtained from a rock unit are analysed statistically following the treatment evolved by R. A. Fisher[2] and the mean declination and inclination values for that particular rock unit are thus estimated. However, the distribution of the points in a pole diagram can also be appreciated if a density diagram is contoured after the manner usually adopted, as mentioned earlier, in structural geology. Since the directions obtained from the same rock unit only approximate a preferred direction (*i.e.*, they would form a coherent distribution if the data is reliable) this preferred direction can be treated as the mean value for the observed unit.

Figure 1 A shown here is a pole diagram of the palæomagnetic directions of 230 Deccan Trap specimens collected from the neighbourhood of Gulbarga.[3] A density diagram corresponding to this data has also been prepared (Fig. 1 B). In a density diagram an area enclosed by a contour line labelled 'x%' means that 'x'% of the toal points used in the pole diagram lie within 1% of the total surface area of the net. Thus the areas between two different contours indicate the average percentages of distribution of the total points, the amount of variation of the concentration being determined by the choice of the contour intervals. Since these contour lines indicate the relative spatial concentration of the directions, the maximum in the density diagram represents the area in which the concentration of the points is maximum. This area, therefore, contains the most representative direction for the total distribution and its centre ran be regarded as an estimate of the mean value for the distribution. As illustrated in Fig. 1 B, the

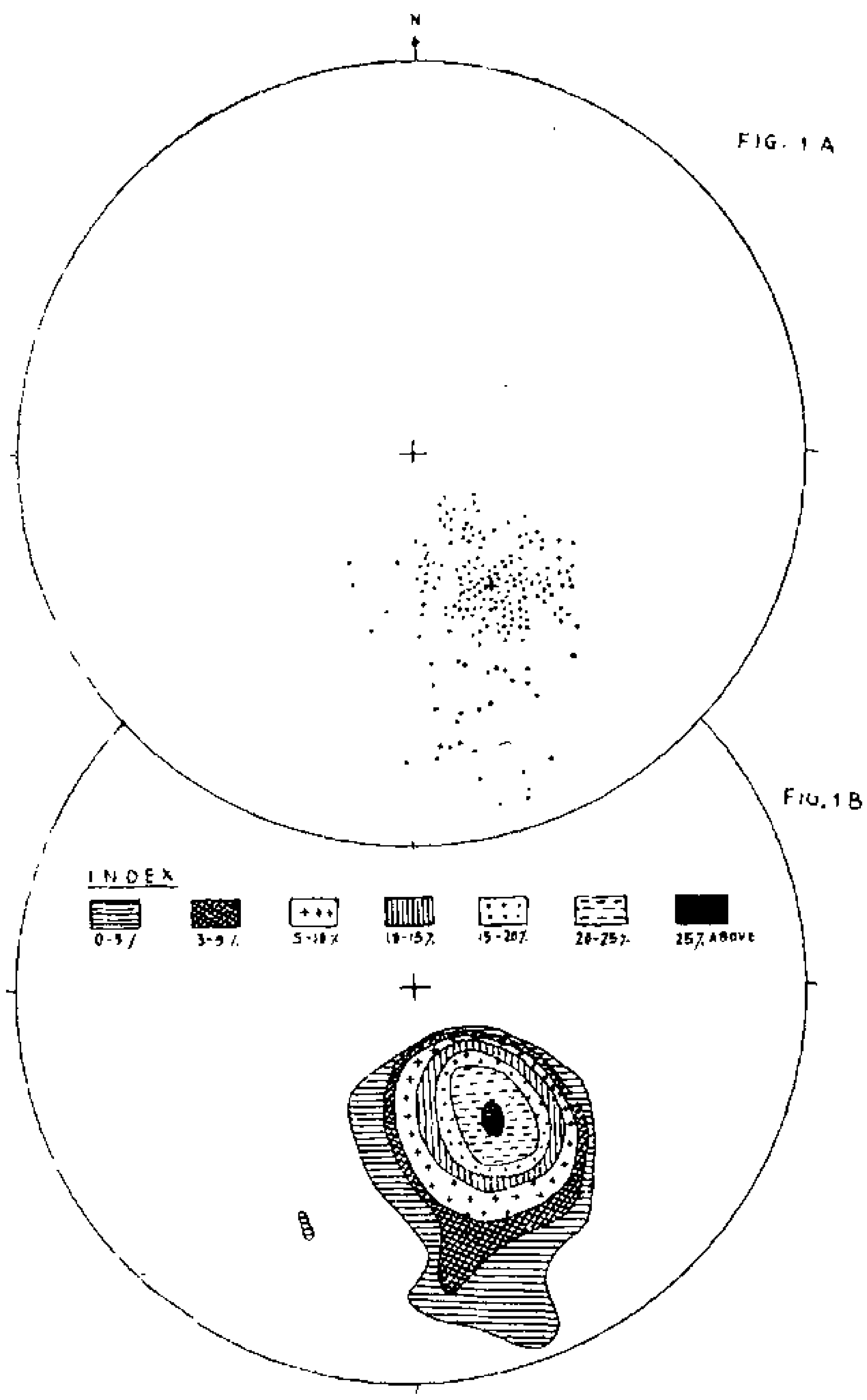

FIG. 1. Palaeomagnetic directions of Deccan Traps of Gulbarga, Mysore. *A*. Pole diagram projected on Schmidt net (All dips down). *B*. Density diagram.

highest contour in the density diagram for the Gulbarga specimens encloses an area where the average concentration is around 25% of the total points plotted in the pole diagram. This means that this concentration represents the directional trend followed by 25% of the vectors plotted as points in the pole diagram in preference to other directions. Since this forms a substantial proportion of the total vectors used in the projection, this area indicates the preferred direction for the total distribution and its density can be treated as an index of the tightness of the group of directional vectors about the true mean direction. In Figs. 2 A and 2 B the pole diagram and density diagram of

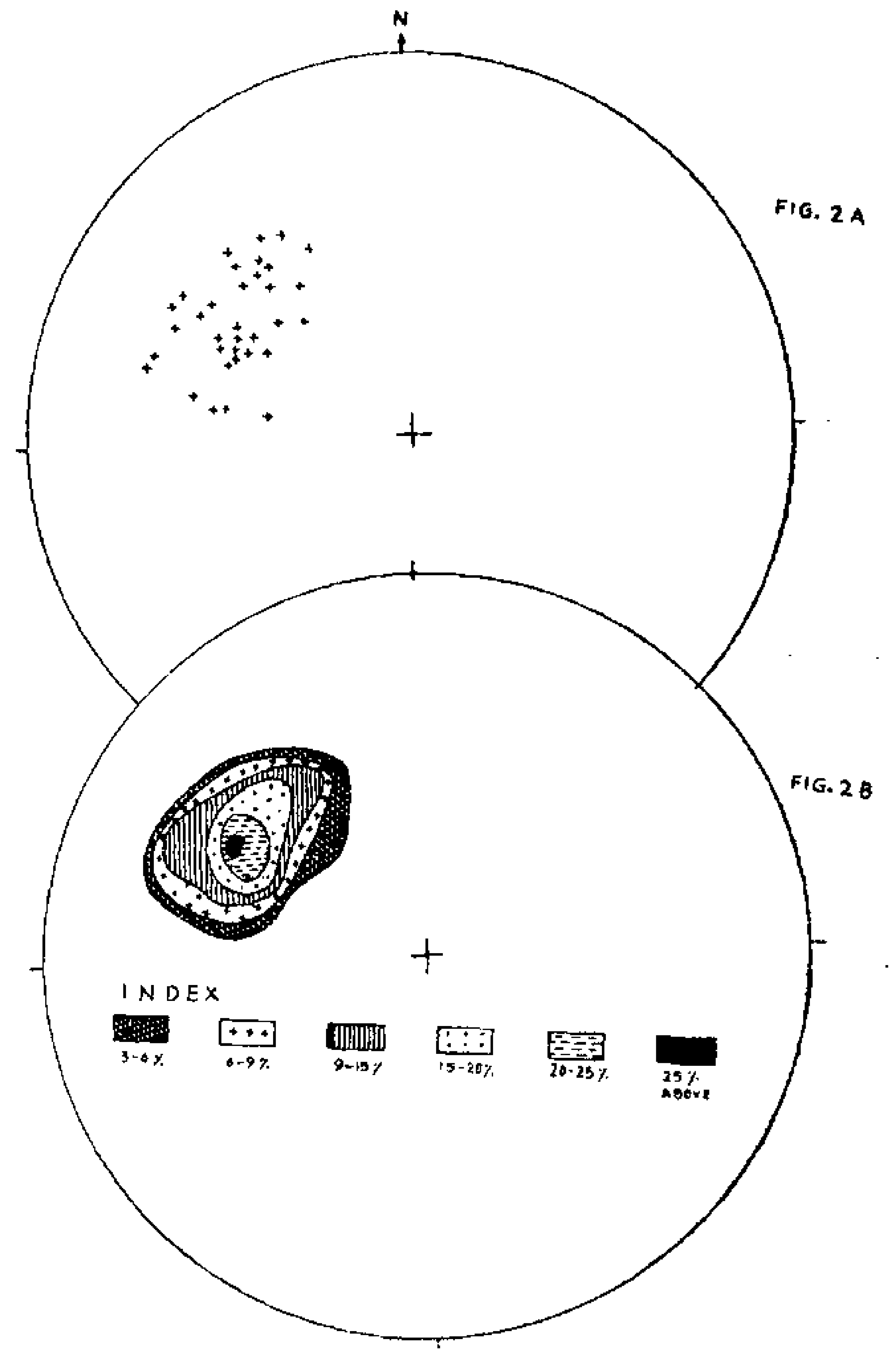

FIG. 2. Palaeomagnetic directions of the Deccan Traps of Rajahmundry, Andhra Pradesh. *A*. Pole diagram projected on Schmidt net (All dips up). *B*. Density diagram.

palæomagnetic directions of 34 Deccan Trap samples from an outlier near Rajahmundry[4] are projected respectively.

Table I summarizes a comparative study of the mean values corresponding to the observations illustrated in the above-mentioned

TABLE I

Sampling site	Direction of the mean magnetic vector: Calculated graphically — Decl.	Calculated graphically — Incl. (Down positive)	Calculated statistically — Decl.	Calculated statistically — Incl. (Down positive)
Gulbarga Deccan Traps ..	150°	58°	1 2°	55°
Rajahmundry Deccan Traps outlier ..	302°	−42°	305°	−45°

figures obtained graphically and by Fisher's statistical treatment.

It is evident from Table I that the graphically obtained mean value is appreciably close to that estimated statistically. It is expected that this approach in the analysis of the palæomagnetic data may provide a better understanding of the dispersion of directions, the significance of their concentration, and the pattern of their preferred orientation. Further work on these lines is in progress and will be reported in due course.

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VERSATILE REPRODUCTION IN *LANTANA CAMARA*

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L. CAMARA Linn., a native of Tropical America, is a very hardy shrub which can grow in poor soil and requires very little care. It has spread to many parts of the old world including India, where it now grows throughout the Deccan Peninsula extending northwards up to sub-mountain regions of the Himalayas. Some varieties are no doubt noxious weeds but others are beautiful ornamentals which bloom nearly the whole year round. The flowers are of various shades of red, orange, yellow and white, giving a striking contrast against its dark green foliage. There is a wide variety of types, differing in the nature of leaves, prickles, bracts, flower colour, etc., which are very difficult to classify because of the extensive reticulation of taxonomic characters. This led Yates[1] of Kew to remark that in Lantanas a "bewildering number of meaningless names" have been used to designate the different types. For such a morpho-taxonomic situation, the nature of breeding system generally offers a valuable key to an understanding of the underlying cyto-genetic mechanisms. The present experiments were started with a view to breed Lantanas for ornamental purposes.

Progenies from open pollinated seeds of five cultivars were raised and scored for their morphological and cytological characters. The results, along with those of Raghavan and Arora[2] are summarized with their implications in Table I and Fig. 1.

The ploidy level of the various cultivars of *L. camara* in NBG ranges from 2 X to 5 X. Meiosis is regular in both diploid cultivars, one of which ('Nivea') is male sterile. The other variety, 'Drap D'Or' has very low seed fertility, and the only plant raised from it was triploid. A character analysis of this 3 X revealed it to be a likely hybrid with 4 X 'Mutabilis'. This implies sexual reproduction. Only one, out of the five plants from male-sterile 'Nivea' (2 X), was perfectly matroclinus. Three other plants, although diploid, are hybrids with related diploid cultivars. The remaining one plant is triploid ; its characters indicate it to be a hybrid with 4 X 'Mutabilis'. The results obtained by Raghavan and Arora[2] on this particular cultivar suggest the occurrence of obligate apomixis. In other words, all types of reproduction from sexual to obligate apomixis occur in the diploids.

The 4 X 'Mutabilis has also a regular meiosis with reasonably good pollen fertility. The progeny raised both by us and Raghavan and Arora[2] is matroclinus. In addition, we have observed that no seed is produced from emasculated and bagged flowers, implying thereby that reproduction is either sexual or by obligate apomixis accompanied by pseudogamy. Further work in this direction is in progress.

The reproduction in triploid ('Red Cap' and 'Mutabilis') and pentaploid ('Purple Prince') cultivars appears to be the result of facultative apomixis. These varieties have a highly irregular meiosis and it is unlikely that their normal sexual progeny could be balanced. The progeny obtained is very likely the result of agamospermy or semi-sexuality. All matroclinus 3 X and 5 X individuals must be the result of the former process, while the individuals with higher chromosome numbers are the result of semi-sexuality, *i.e.*, their unreduced eggs get fertilized by pollen from related cultivars. For instance, 4 X and 5 X plants, obtained in the progeny of 3 X 'Red Cap', can arise by the union of its unreduced triploid eggs with X pollen from 2 X