The present study comprises investigation of some Indian plant species for hemagglutinin, hemolysin and precipitin activity against the blood (red cells and serum) of twelve vertebrate species. The program envisaged testing the plant varieties representing varied taxons, with emphasis on succulents and plants belonging to the families Gramineae and Leguminosae.

A total of 168 plants belonging to 38 different families were examined. These included 115 seed varieties and 53 succulent vegetative portions mostly derived from xerophyte species. Plant extracts were prepared in isotonic saline solution using standard techniques. Hemagglutination tests were carried out using saline suspended as well as enzyme treated red cells. Cystine activated papain enzyme was used to detect incomplete phytagglutinins. Precipitin activity against human and animal sera were detected through immunodiffusion tests. Eighteen to fifty red cell samples and fifteen to thirty serum samples were tested from each animal species. The different animal species tested include man, monkey, rat, rabbit, goat, sheep, cow, buffalo, horse, mule, guinea-pig and foul.
Of the 168 plant extracts tested, lectin activity was detected in as many as 87 varieties. Sixty five plant varieties were found to contain hemagglutinins, eighteen plants contained hemolysins and thirty one plant extracts showed precipitin activity against the sera of one or more animal species tested.

Of the sixty five plant extracts showing hemagglutinin activity, thirty seven were saline agglutinating. The remaining twenty eight were typed as incomplete agglutinins, as these were reactive only against the enzyme treated red cells. On the basis of their characteristic reaction patterns, three types of lectins could be distinguished:

(a) **Pan agglutinins**

These lectins are wide spectrum reagents in the sense that they were able to cause agglutination of erythrocytes irrespective of their source species. Only three plants *Morus alba* (022), *Triticum durum* (057) and *Erythrina variegata* (108) were classified as belonging to this category.

(b) **Species specific phyt-agglutinins**

These lectins are able to agglutinate the red cells
of all individuals belonging to a particular animal species without any distinction. The following 24 plant varieties were classified as belonging to this category:

**Anthoccephalus indicus** (005), **Sesbania grandiflora** (008), **Grevillea robusta** (013), **Triticum aestivum** var. HI-8073 (025), **Triticum aestivum** var. J-190 (026), **Triticum aestivum** var. Raj-1555 (028), **Nyctanthus arboristrus** (029), **Lagerstromia flosregina** (032), **Triticum aestivum** var. Sonalika (037), **Triticum aestivum** var. CC-525 (043), **Abies pindrow** (045), **Gysoipium hirsutum** var. H-14 (052), **Triticum aestivum** var. IUP-72 (054), **Hordeum vulgare** var. NP-113 (059), **Triticum aestivum** var. HD-2009 (059), **Sterculia alata** (065), **Paspalum serobiculatum** var. C02 (075), **Terminalia peniculata** (076), **Oxynanthera parvifolia** (079), **Dillenia indica** (096), **Caesalpinia tortura** (104), **Pongamia pinasta** (106), **Desmodium gangeticum** (109), **Mimosa pudica** (111).

(c) **Group Specific Phyt-agglutinins**

Members of this group are highly selective in their reaction pattern, in the sense, that their reactivities are directed against some but not all
individuals within an animal species. Only two examples of this kind were discovered by the present study. *Tecoma stans* (023) is human blood group 'A' specific and *Echinocloa frumentacea* (084) gave dimorphic reactions with enzyme treated cow erythrocytes.

There remains another unclassified, though an important category of plant agglutinins. These extracts reacted selectively with saline suspended (complete agglutinins) or enzyme treated (incomplete agglutinins) red cells of two or more animal species but failed to agglutinate the red cells of most other animal species.

Eighteen plant extracts were found to contain hemolysins against human and animal red cells. Fourteen of these were saline reacting, whereas the remaining four reacted with enzyme treated red cells. Two plant extracts *Duranta plumieri* (046) and *Jatropha heterophyla* (124) lysed the red cells suspended in saline of all the twelve vertebrate species tested. Extracts of the following eight plants were found to contain species specific hemolysins:

- *Lawsonia alba* (001), *Sesbania aegyptica* (003),
- *Cynodon dactylon* (009), *Annona squamosa* (011),
- *Azadirachta indica* (012), *Tecoma stans* (023),
Immunodiffusion tests with lectins against human and animal sera revealed precipitin activities in thirty-one plants. None of the extracts could be classified as pan-precipitin. Twenty-four of the thirty-one plant precipitins were found to react in a nonspecific manner reacting with two to nine animal species. Seven examples of species-specific precipitins were discovered by this study. These are: *Sesbania aegyptica* (003), *Saraca indica* (019), *Tecuma stans* (023), *Cedrus deodara* (068), *Mallotus philippinensis* (088), *Caesalpinia torta* (104), *Cerebellum umbellata* (117). Extracts of five plants developed two precipitin bands with the sera of one or more animal species in agar gel. These are: *Prunus padum* (002), *Anthoccephalus indicus* (005), *Mallotus philippinensis* (088), *Terminalia myriocarpa* (091), *Shorea robusta* (099).

The results obtained from the interaction of hemagglutinins, hemolysins, and precipitins were utilized to develop procedures for distinguishing the blood specimens of twelve vertebrate species. The red cells of eight animal species could be identified on the basis of species-specific reactions of certain plant extracts (see Table XIV). Similarly, selectively reacting hemolysins could be utilized to diagnose the red cells of some of the animal species tested. It was possible to characterize
the sera of six animal species using a single plant precipitin in each case. Identification of other animal species could be accomplished by employing a combination of two or more lectins.

The study revealed significant differences in the serological activity of plant varieties belonging to the same species. In view of this it was considered appropriate to recommend the use of variety names alongside the species name, in reporting lectin activities of various plants, as emphasized elsewhere (Gaur, 1982).

Hemagglutination and precipitation data relating to non-specific lectins were separately processed to study immunological correspondence between twelve animal species. The statistical program 'CLAN' was used to produce phenograms using three hierarchical agglomerative clustering algorithms. Phenograms documented similarities in closely related animal species as detected by lectin interactions. Data from hemagglutination tests were found to provide a better insight of the immunogenetic correspondence between various animal species. On the other hand, data from agar gel diffusion tests showed several gross inconsistencies in comparison with phylogenetic trees based on morphological systematics. The study highlights the potential of lectins as diagnostic tools in dealing with the problems of forensic and anthropological interest.