I N T R O D U C T I O N

The present day cultivars are a far cry from their wild progenitors and this has been made possible by the long, arduous and skilful process of human interference over the years. Rapid development of agriculture in the last few decades to feed the multiplying millions has led to the evolution of more and more new varieties to take care of the specific needs of the growers in the different agro-climatic regions of the world. Thus while there is an influx of novel varieties the old crop varieties are on the way out due to neglect, non-utilization or limited cultivation. The disappearance of yesterday's tall, lodging prone, poor nitrogen responsive cultivars of wheat and rice with the advent of dwarf, high nitrogen responsive, lodging tolerant, high yielding varieties of wheat and rice crops is a case in point in this connection. Even though the varieties of yester years have fallen into disrepute and are finding little use in cultivation nowadays, their importance as reservoirs of variations is great and realisation of this in recent years has led to the preservation of plant gene pools in the form of germplasm collection and their preservation in seed banks and field gene banks have become common practice throughout the world (Frankel and Bennett, 1970; Frankel and Hawkes, 1975; Brown, 1978; Holden and Williams, 1984) for providing building materials for future crop improvement. The accessions are checked regularly for their identification and purity.

The vigorous activity of plant breeders in recent years has led to a floodtide of new varieties and this in turn has led to the

testing of cultivars for their identification and purity. The methods for such testing are somewhat integrated in the definition of 'cultivar' by Brickell et al. (1980). According to them, "the international term cultivar denotes an assemblage of cultivated plants which is clearly distinguished by any characters (morphological, physiological, cytological, chemical or others) and which, when reproduced (sexually or asexually) retains its distinguishing characters. The cultivar is the lowest category under which names are recognised in this code. This term is derived from cultivated variety or their etymological equivalents in other languages".

Morphological study ranges from seed to the whole plant. For making morphological distinctions between varieties, seeds, young seedlings, full grown plants of cultivars of crop plants have been used. Grow out test, viz. growing of plants under field condition has been of immense help often in identification of growth features with the help of which varieties could be identified. This method, though simple, has got its limitations. It is time consuming and often cost inhibitive. The results are only available after the seed-lot has been sown and crop harvested. Moreover, at times adverse field condition may make the results questionable or inordinately delay the outcome of the work. One way out of the above impasse is to conduct the 'grow out test' in greenhouses, preferably control chambers where the environment can be continuously monitored or adjusted at will to bring out the differences among cultivars which are not detectable under identical growing condition of the field. But

growing plants in greenhouses or controlled environment chambers is once again a costly proposition. In tropical countries, cooling arrangement of the greenhouses is a must whereas in cold countries, heating arrangement of the greenhouses is a necessity. Better perhaps is exposure of the plants to various kinds of stress and monitoring the response of cultivars to stress and often this method has been found to be very useful in distinguishing crop cultivars. Some of the methods of imposing stress on crop cultivars in this connection are salinity stress, drought stress, chemical stress, nutritional stress, defoliation of seedling etc. Pest and disease resistance of cultivars too have been useful.

Among the laboratory methods of identifying cultivars, the most important one has been electrophoresis of proteins. Seeds as well as leaf proteins are extracted and the proteins separated in a gel matrix on the basis of molecular size and charge. After the separation of protein bands, the proteins are stained with suitable dye and the banding patterns are compared to find out the characteristic protein bands of a cultivar. In view of the fact that the separation of the proteins can be manipulated by changing the extraction media and their pH, the pH and composition of the gel, the versatility of this method is unique. Moreover, this method can be used with equal ease to detect storage proteins or isozyme bands. In view of the ease and reproducibility of the method when performed by a skilled worker and the ability to distinguish cultivars at the seed level (using soluble storage protein or a fraction of it), this

has been widely used all over the world and in the case of many crops, fingerprints of storage proteins have been documented and preserved for use as reference for identification of commercial seed lot from the market.

The importance of germplasm collection has been realised only recently in the third world countries and this has led to the starting of gene banks. Cultivar identity is mainly established by morphology of the seed and grow out test. Other supportive methods are not used to any great extent by the seed testing laboratories and they are mainly concerned with presence of foreign substances in the seed, germinability and vigour of the seed. Moreover, the work of the seed testing laboratories is concerned mainly with crops of great economic importance like cereals, pulses, oil seeds, fibre crops etc. In the absence of organised commercial cultivation of vegetables, there is hardly any authentic verification of the purity of the vegetable seeds. Seed certification in the case of vegetables is an exception rather than the rule. Vegetable seed business is in the hands of private seed growers and they sell seeds without any authenticating certificate usually. At most, they sell 'truthfully labelled' seeds. How truthful are the truthfully labelled seeds is altogether a different question and yet to be verified scientifically.

That everything is not well with the vegetable seed industry in India is exemplified by the large number of litigations pending

before the different state authorities of India where seeds of a particular variety of a vegetable crop has been found to belong, on growing, to another variety or be a mixture of two or more varieties.

Previous work in this laboratory (Pathak, 1989a, 1989b) clearly showed that jute cultivars as well their germplasms, not yet released for cultivation could be distinguished by using morphological, physiological and biochemical methods very clearly, and this led us to veer into the present work, the cultivar identification of tomato (Lycopersicon esculentum Mil.), one of the most important vegetable crops of the world. Nine varieties of tomato, commonly cultivated in the state of West Bengal were taken up for the study and efforts were made to identify them by morphological, physiological or biochemical methods.

However, it is admitted that in all the experiments not all the varieties could be accommodated. In the grow out test in field, the variety Best of All could not be included due to poor germinability of the seed lot and hence it was also not included in the study on the effects of nitrogenous fertilizer on seed protein banding pattern. The variety Oxheart was excluded from aging treatment and N effect study because of the small number of seeds available from field experiment.