Evaluation and Utilisation of *Solanum* spp. Germplasms

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Introduction

Eggplant (*Solanum melongena L.*) is one the most important horticultural species from the genus *Solanum*. Taxonomically, it is very complicated species comprising various cultivated, weedy and wild forms, which are always overlapping groups.

Eggplant production is always limited by bacterial wilt disease caused by *Burkholderia (Pseudomonas) solanacearum* (Hasan, 1997). This systemic disease could not be eliminated by conventional methods of disease control. The most effective method for combating this disease is through hybridisation by producing high resistant variety.

The use of Effective Micro-organisms (EM) has also been recommended as an alternative method to control the bacterial wilt disease. EM is a mixed culture of beneficial microorganisms, which are able to provide a favourable microbiological equilibrium in the plant rhizophere and then help to control the disease (Hasan and Abdullah, 1998).

It is very important to evaluate the eggplant germplasms and analyse the inheritance of bacterial wilt resistant gene and cross-ability relationship among the taxa in order to identify genotypes with useful characters for the crop improvement. Therefore, the study was conducted with the following objectives; to assess the variability of morph-agronomic traits present in *Solanum* spp. genetic resources collected throughout Malaysia and abroad; to assess the level of bacterial wilt resistant within the eggplant germplasm for selecting genotypes with high level of resistance against the disease; to analyse seed protein profile of eggplant genotypes by gel electrophoresis and the possibility of using the profile for cultivar identification; to find out eggplant genotype that could possibly be used as parents to produce high resistance cultivar against bacterial wilt disease; and to assess the effect of Effective Micro-organisms (EM) on bacterial wilt establishment as an alternative means to control the disease.

Materials and Methods

Seed samples of eggplant germless of about 400 accessions representing diverse agro-ecological areas in Malaysia and abroad obtained from previous collection were used in this study. The seeds were stored in refrigerator at below than 5 ° C and the accession data were systematically recorded according to the IBPGR protocol.

Evaluation of morphological and physiological variability was conducted on plants grown mostly in pots, irrigated and fertilised by using drip-irrigation system. The evaluations were made using a set of characters mostly selected from the IBPGR descriptor (1988) for the eggplant. List of accessions and characters used are presented in Hasan and Abdullah (1997).

Screening for bacterial wilt resistance was only conducted under the greenhouse condition. The plants were watered and fertilised by using drip-irrigation system. Inoculation of bacteria suspension was done through the stem at the third leaf axial. Wilting symptom was then recorded according to the number of day they arise and number of plant effected to classify genotype into various level of resistant against the disease (Hasan and Abdullah, 1997).

For electrophoresis study, seed protein profile from 54 accessions of eggplant representing a range of agro-geographical and morphological forms were assessed using the technique of SDS-polyacrylamide gel electrophoresis (SDS-PAGE) of seed protein. Details of protein sample extraction from seeds, gel preparation and electrophoresis operation have been explained in Hasan and Isa (1998).

Analysis on inheritance of bacterial wilt resistant gene and some other agronomic characters were made on six selected high resistance parents and their hybrids. The genotypes were grown and hand or controlled crossing was then made among the genotypes. The level of hybrid vigour (*heterosis*) and the parental combining ability for the character was then calculated to identify the promising parents and hybrids for crop improvement.

Examination on the effect of effective micro-organisms (EM) was carried out in the cultivated field previously infested with the bacterial wilt disease. The susceptible variety was randomly grown in homogenised 5 x 5 m plot treated with either EM or fertiliser Ca (NO3)2 alone or EM + Ca $(NO3)_2$. The incidence of the bacterial wilt was then monitored for every week until the end of the season (Hasan and Abdullah, 1998).

Results and Discussions

Morphological and physiological variability as measured by the coefficient of variation showed a wide range of diversity for many characters. Number of days to germination, flowering and harvested fruit formation ranged between 4 - 39, 64 - 173 and 97 - 192 days respectively. Plant height ranged from 25 - 140 cm, flower number per cluster ranged between 1 - 6. Fruit shape varies from round, pear- and club- shape to oblong and cylindrical meanwhile fruit colour varies from white, green, yellow, purple to deep purple (Hasan and Abdullah, 1997). These characters could arbitrarily dis-

tinguish eggplant complex into advanced and primitive cultivars, weedy and wild groups of eggplant.

The result of bacterial wilt screening also showed a wide variation of the resistance degree present in the genetic resources of eggplant used in this study. Out of 111 accessions tested about 8% were fairly high resistance, 16% were moderate resistance and 76% were susceptible against the disease (Hasan and Abdullah, 1997).

The profiles of SDS-PAGE of seed protein revealed a great variation within and between the groups of eggplant. There are 14 protein banding patterns characterising the genotypes of eggplant into advanced cultivars of large elongated, pear- and club-shape and round fruits, primitive cultivars with small fruit, prickly wild and weedy habit and ancestor species of *Solanum incanum* groups. The profiles are reproducible and can be used as a marker for cultivars identification that can be performed within a couple of hours without necessity of growing out the plants (Hasan and Isa, 1998).

The results of screening test on the hybrids derived from hybridisation of resistant parents revealed that the resistant shown by some hybrids were much higher than the level posses by their parents. The performance of most agro-morphological characters, such as fruit weight and size and total yield, in the hybrids were also significantly higher than their parents. This exhibited that hybrid vigour (heterosis) was expressed in the hybrid by those characters, and thus such gene, particularly the resistant gene against bacterial wilt disease, could be accumulated into the progeny through hybridisation for the further improvement.

The use of EM in combination with fertiliser Ca (NO3)2 capable to delay the establishment of the disease in eggplant and that would allow the crop to produce yield profitably before the disease reaches a critical levels. This method, however, could not eliminate the diseases completely (Hasan and Abdullah, 1998).

Conclusions

The study has successfully differentiated and classified the complicated variability of the eggplant (*Solanum melongena* L.) into groups of modern and primitive cultivars, wild and weedy plants on the basis of agro-morphological features and protein banding patterns. This grouping was useful for the purpose of breeding programme of the crop. This study also selected several resistant accessions against bacterial wilt symptom and accumulated the traits through hybridisation of moderate resistance taxes.

Benefits from the Study

Development of electrophoresis, diseases screening, hybridization, breeding and preservation techniques in studying eggplants and other *Solanum* species have been revealed in this study.

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