6. SUMMARY

The primary objective in local chilli production is improvement in yield with good capsaicin level and colour. In addition, the generated variety must be of high conversion rate and fast to dry and show some field tolerance to pests and diseases.

Sixty-four varieties with variability in agronomic and quality characters were evaluated in preliminary screening trial. The results were indicative of a wide range of genetic potential from which twenty-two varieties were selected for further multilocational trials.

Multilocational trials showed that environmental variance contributed about 70% of the total variance in yield, the remaining 3% was due to genotypic variance, 9% was due to GxE and 18% was due to residual. The high environmental component suggests the possibility of yield improvement by manipulation environmental variables. The high environmental effects on yields were contributed mainly by location and planting- season interaction within location and location variation.

Greater environmental influence relative to genetic effect was also observed in number of fruits/plant, days to harvest, plant height, days to dry, capsaicin, light transmission, percentage of bleaching, dry weight, conversion rate and mean fruit weight. The strongest contributing factors in the environment effect are the interaction between location x planting-season and location. The significant first and second order interactions indicated the necessity for multilocational testing of genotypes in order to characterize genotypic performance more precisely.

The present study also revealed the existence of very significant genotype environment interaction for all the characters studied, namely yield, mean fruit weight,

number of fruits/plant, maturity, plant height, capsaicin content, colour of the product, percentage of bleaching which reflects colour retention, dry weight and conversion rate, indicating the instability of these characters.

Relative to genotypic effect, GxE has greater effects on yield, capsaicin, light transmission and days to dry. The GxE effect on capsaicin was due to significant genotype x location x planting-season, location and planting-season. The possible influencing environmental factors include rainfall, moisture, and temperature and soil type.

GxE component for percentage of bleaching and colour retention was influenced mainly by genotype x location x planting-season effects.

The high genotypic coefficient of variation (GCV) was found in yield, mean fruit weight and number of fruits/plant. However, mean fruit weight and number of fruits/plant showed higher heritability estimates than yield. Other characters with high heritability ($h^2 = 0.85$) but moderate GCV were conversion rate, dry weight, plant height and percentage of bleaching. Relatively low GCV values were noted for capsaicin level, light transmission and days to dry. Days to harvest showed moderate heritability.

Yield was found to be negatively correlated with capsaicin level but positively correlated with mean fruit weight and number of fruits/plant. Consequently, yield improvement through selection for bigger fruit (heavier mean fruit weight) might result in lower capsaicin content. Under these circumstances, selection for higher number of fruits/plant for indirect response in yield may be a better approach. Furthermore, fruit number was also positively correlated with some desirable characters such as conversion rate and capsaicin.

The present study also indicates that major climatic limitations to chilli

production were prolonged drought and surplus rainfalls. Better yield performance was obtained in mineral soil region and in cooler temperature such as Cameron Highlands. However, higher temperate as in zone 1 is more favourable for both yield and capsaicin. For the production of chilli with higher capsaicin formation, the most favourable environment is Bertam and Gajah Mati, in the northern region where there is distinct dry period. Other mineral areas such as Telong and Kundang with rainfall of more than 200 cm/annum showed suppressive effect on capsaicin formation.

The presence of genotype x environment interaction reduces the usefulness of genotype means for identifying superior cultivars (Magari and Kang, 1993). When both yield and stability were considered according to Kang's (1991a), the highest yielder MC4 (446g/plant), and the second highest yielder V61 (445g/plant), dropped to the 5th position and sixth position respectively. Variety Ch291-P (V1) with 432 g/plant topped the list, followed closely by Ch388 (V57) (443 g/plant). Varieties MC11 (395 g/plant) and Ch389 (V58)(442 g/plant) were next on the list. This was followed by MC4, Ch393 (V61), Brebes (V44)(404g/plant), Kulai (388 g/plant, and Ch291 (V32) (382 g/plant) and Purple chilli (363 g/plant) in descending ranking.

Varieties with high yield and relatively stable were preferable. Based on means and stability of all the characters, Brebes (V44) the variety with the most favourable score with stability in all the twelve tested characters namely yield, fruit number, dry weight, capsaicin level, days to dry, low percentage of bleaching, good colour and acceptable fruit size is most desirable.

Variety with the second highest in rank based on the total score is Huey Sithon, *a cili padi* like chilli from Thailand with stability in 9 characters.

Several other potential varieties include MC11, Purple Chilli, Ch388 (V57), Ch38 (V58) and Ch393 (V61) with stability in ten or more characters except for V61 which showed stability in nine characters only, were selected for dual purpose. MC11 is recommended fresh and dry chilli production while Purple chili is more suitable for processing, both in wet or dry form. The latter two varieties are more for fresh used. Having high conversion, they can be used for processing purposes.

Other potential *Cili padi* like chillies sister lines Ch252-C (V28) and Ch252-C (P) (V49). They are highly stable in characters such as capsaicin level, number of fruit/plant and mean fruit weight. These varieties and Huey Sithon could be recommended as an alternative to *cili padi*, which is normally lower in yield and late maturity.

Varieties Ch257 (V25) and Purple Chilli showed specific adaptability, both showed good performance in Cameron Highlands, probably more suitable for higher elevation where the temperature is cooler.

Ease of drying and percentage of bleaching are factors influencing dry chilli production. Environmental conditions especially with no distinct dry period and high relatively humidity is non-favourable for dry chilli production in Malaysia.

As it is required about 4-6.6 kg of fresh chilli to produce 1 kg of dry chilli, it is not cost-effective. When the artificial drying cost of RM3.90 (Samsudin *et al.* 1992) was considered, it becomes less economical in comparison to the imported cost of dry chilli at RM4-8 /kg.