Adaptability of Thai sugarcane varieties in China

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Abstract In 2010, Mitr Phol Sugarcane Research Center Co. Ltd selected several high-yielding and smut-resistant sugarcane varieties in Thailand for testing in the sugarcane area of East Asia Sugar Group (Mitr Phol China) in Guangxi Province in China. This was aimed at enhancing the production of sugarcane for Mitr Phol in China. The Thai varieties tested were MPT1, MPT2, MPT3, MPT99-1382, K95-84, UT6, SP80 and KK3. The study was conducted as regional trials in Guangxi Province over one-year plant cane and one-year ratoon cane. The results showed that the variety UT6 was superior to the current major cultivar ROC22 in terms of cane yield, fibre content, millable cane stalks, cane diameter, cane height and resistance to smut disease but was lower in sucrose content than ROC22. KK3 showed the best ratooning ability. Some Thai sugarcane varieties proved highly resistant to smut while ROC22 is susceptible. The results of this study are encouraging for further testing of Thai varieties to raise the productivity of sugarcane in China.

Key words Thai sugarcane varieties, adaptability

INTRODUCTION

In the cropped area of sugarcane in China, one major problem is the prevalence of smut disease that causes severe yield loss in production (Que et al. 2012; Shen et al. 2013). The variety ROC22 is the most popular sugarcane variety throughout China, having been grown for more than 10 years and occupying almost 70% of the total sugarcane area in Guangxi Province. As this variety is very susceptible to smut disease (Li and Yang 2015), Mitr Phol Sugarcane selected eight high-yielding sugarcane varieties from Thailand to test in their sugarcane mill area of China, where the climatic conditions are different from those in Thailand. While most of Thailand is tropical wet and dry, southern China has a warm, monsoon-influenced humid subtropical climate.

Although, sugarcane is a thermophilic crop grown in both tropical and subtropical regions (Balasundaram 2005; Zhang et al. 2015), there is large difference in cane productivity between tropical and subtropical zones (Balasundaram 2005). The introduction of tropical sugarcane varieties to subtropical regions must therefore be studied first to determine their adaptability in those regions, and the results from this investigation are reported here. In addition, the present experiment was also designed to show whether the varieties of sugarcane from Thailand remain resistant to smut disease in China.

MATERIALS AND METHODS

In 2010, eight high-performing sugarcane varieties from Thailand (MPT1, MPT2, MPT3, MPT99-1382, K95-84, UT6, SP80 and KK3) were sent to China. After they had been quarantined at the Guangxi Academy of Agricultural Sciences for one year, they were planted in 2011 to increase the seed cane population. Using the seed cane produced, regional field trials were conducted in Guangxi Province of China over one plant crop and one ratoon crop on a site with clay soil.

The experiments were laid out in a randomized complete block design with three replications. In this study, the main focus was comparison of the Thai varieties with the Chinese variety ROC22. At the harvest of the plant crop cane in March 2014 and of the ratoon crop cane in February 2015 measurements of stalk diameter, cane height; millable stalks per unit area and cane yield were made. Observations in the field on the incidence of smut disease were also recorded during the rainy season both in plant cane and in first-ratoon cane. Evaluations of smut resistance were also made under laboratory conditions by the method of Singh (1982).
RESULTS AND DISCUSSION

The highest cane yield averaged across plant and ratoon crops was found with variety UT6 (88.4 t/ha) compared to 72.5 t/ha observed with the standard variety ROC22. However, variety UT6 also showed the largest cane yield decline in the first ratoon. By contrast, KK3 showed the lowest cane yield decline (10.4%), compared with a decline of 19.3% for ROC22.

All Thai varieties were lower in sucrose than ROC22.

All Thai sugarcane varieties were resistant to smut disease and some were even highly resistant. MPT2 and K95-84 were found to be only moderately resistant in laboratory tests but were not infected by smut when evaluated in the field. ROC22 was susceptible to smut in both the laboratory tests and in the field evaluation with a smut infection level of 5.01%.

Table 1. Comparison of smut resistance and pertinent agronomic data (mean of plant cane and first ratoon) of eight Thai sugarcane varieties with those of the standard variety ROC22.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Sucrose (%)</th>
<th>Fibre (%)</th>
<th>Cane yield (t/ha)</th>
<th>Yield decline (%)</th>
<th>Millable cane stalks (ha)</th>
<th>Cane diameter (cm)</th>
<th>Cane height (cm)</th>
<th>Smut disease evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPT1</td>
<td>14.91</td>
<td>10.71</td>
<td>70.2</td>
<td>25.6</td>
<td>64,330</td>
<td>2.60</td>
<td>231</td>
<td>1.13</td>
</tr>
<tr>
<td>MPT2</td>
<td>13.98</td>
<td>10.56</td>
<td>76.7</td>
<td>32.8</td>
<td>43,980</td>
<td>2.80</td>
<td>267</td>
<td>0.00</td>
</tr>
<tr>
<td>MPT3</td>
<td>14.34</td>
<td>10.57</td>
<td>67.9</td>
<td>49.8</td>
<td>45,980</td>
<td>2.29</td>
<td>240</td>
<td>0.19</td>
</tr>
<tr>
<td>MPT99-1382</td>
<td>14.80</td>
<td>11.47</td>
<td>77.0</td>
<td>26.2</td>
<td>51,660</td>
<td>2.60</td>
<td>278</td>
<td>0.51</td>
</tr>
<tr>
<td>K95-84</td>
<td>12.56</td>
<td>9.92</td>
<td>68.2</td>
<td>51.4</td>
<td>42,340</td>
<td>2.68</td>
<td>242</td>
<td>0.00</td>
</tr>
<tr>
<td>KK3</td>
<td>13.71</td>
<td>10.59</td>
<td>76.9</td>
<td>10.4</td>
<td>72,530</td>
<td>2.22</td>
<td>219</td>
<td>0.00</td>
</tr>
<tr>
<td>SPB80</td>
<td>12.67</td>
<td>10.05</td>
<td>69.4</td>
<td>16.4</td>
<td>61,390</td>
<td>2.37</td>
<td>231</td>
<td>0.00</td>
</tr>
<tr>
<td>UT6</td>
<td>13.35</td>
<td>10.84</td>
<td>88.4</td>
<td>28.9</td>
<td>53,540</td>
<td>2.60</td>
<td>295</td>
<td>0.29</td>
</tr>
<tr>
<td>ROC22</td>
<td>15.44</td>
<td>10.37</td>
<td>72.5</td>
<td>19.3</td>
<td>52,620</td>
<td>2.54</td>
<td>254</td>
<td>5.01</td>
</tr>
<tr>
<td>CV %</td>
<td>3.21</td>
<td>2.24</td>
<td>6.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LSD 5%</td>
<td>0.3659</td>
<td>0.2107</td>
<td>3.994</td>
<td></td>
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</table>

S = susceptible; MS = moderately susceptible; MR = moderately resistant.

*Yield decline is reduction in the first ratoon compared with the plant crop.

CONCLUSIONS

The results of our study indicate that some Thai sugarcane varieties may be advantageously cultivated in the sugarcane growing areas of China. Variety UT6 appears to be the most suitable and was superior to ROC22 for cane yield, fibre content, millable stalks, cane diameter, cane height and resistance to smut. However, UT6 also gave lower sucrose content. KK3 showed good ratooning ability and could serve to improve production in ratoon crops in China. MPT2 and K95-84 proved to be highly resistant to smut disease but, unfortunately, their ratooning ability tended to be poor.

The introduction of Thai sugarcane varieties history in China is still in its early phase with the varieties having currently only been studied in China for 2 years. Feedback from Chinese farmers about their preferences and needs are essential if we want to use the characteristics of the Thai varieties to breed in the future a new generation of sugarcane varieties for the Chinese industry.

REFERENCES


L’adaptation des variétés de canne à sucre en provenance de la Thaïlande en Chine

Résumé. En 2010, Mitr Phol Sugarcane Research Center Co. Ltd a choisi plusieurs variétés de canne à sucre à fort potentiel en rendement et résistantes à la gommose en Thaïlande pour l’évaluation dans la zone de culture du East Asia Sugar Group (Mitr Phol China) située dans la province du Guangxi en Chine. L’objectif est d’améliorer la productivité sucrière de Mitr Phol, Chine. Les variétés Thaïlandaises évaluées étaient MPT1, MPT2, MPT3, MPT99-1382, K95-84, UT6, SP80 et KK3. L’étude a été conduite dans des essais régionaux dans la Province du Guangxi sur la canne vierge et une repousse. Les résultats ont montré que la variété UT6 était supérieure en comparaison à l’actuelle variété dominante ROC22 en terme de rendement en canne, le taux de fibre, aux nombres de tiges usinables, le diamètre des tiges, la hauteur et la résistance à la gommose, mais était inférieure à ROC22 pour sa teneur en saccharose. La variété KK3 a démontré une meilleure performance en repousse. Quelques variétés Thaïlandaises sont résistantes à la gommose tandis que la ROC22 est susceptible. Les résultats de cette étude sont encourageants du point de vue de l'évaluation variétale dans le but d'augmenter la productivité en Chine.

Mots-clés: Variétés de canne à sucre Thaïlandaises, adaptabilité

Adaptabilidad de variedades Tailandesas de caña de azúcar en China

Resumen. En el año 2010, el Centro de Investigaciones de Mitr Phol Co. Ltd seleccionó varios clones/variedades de caña de azúcar de alto rendimiento y resistente a la carbón en Tailandia para pruebas en el área de producción de caña de azúcar del grupo azucarero Mitr Phol de China, Asia Oriental, en la provincia de Guangxi en China. Cuyo objetivo principal en mejorar la producción de caña de azúcar para Mitr Phol en China. Las variedades Tailandesas evaluadas fueron MPT1, MPT2, MPT3, MPT99-1382, K95-84, UT6, SP80 y KK3. El estudio fue parte de las pruebas regionales en Guangxi Province, un año en caña planta y un año en caña soca. Los resultados mostraron que la variedad UT6 fue superior en producción de caña, contenido de fibra, tallos molinable, diámetro y altura de tallo y resistente a carbón; pero con menor contenido azucarero. La variedad KK3 mostró una mejor habilidad de rebrote. Algunas variedades Tailandesas mostraron alta residencia a carbón comparada con ROC22 que es susceptible. Los resultados de este estudio se muestran promisorios para continuar con las pruebas de variedades tailandesas y así ayudar a incrementar la productividad de caña de azúcar en China.

Palabras clave: Variedades caña tailandesas, adaptabilidad