The Production and Characteristics of the New Tulip Cultivar, ‘Arisa’

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Abstract

In 1979, we harvested 955 seedlings from a cross between ‘Don Quichotte’ and ‘Ben van Zanten’. After 6 years cultivation, 8 lines were selected in 1985. ‘Arisa’ had adaptability of forcing and resistance against bulb rot caused by *Fusarium oxysporum* and tulip mild mottle mosaic virus. It was registered in 2002 as Tulip Norin No. 23 by the Ministry of Agriculture, Forestries and Fisheries, Japan, after 3 years of national license examination starting in 1999. ‘Arisa’ has a single flower and it flowers in the middle of April in an ordinary year. The flower colour is wine red (R.H.S. colour chart: 71B), edged purplish pink (R.H.S. colour chart: 64C). ‘Arisa’ has adaptability of forcing, and blooms 100% before Christmas. The harvest time is mid June. Recently, there are a few occurrences of both *Fusarium* and tulip mild mosaic mottle virus, the tulip disease. The occurrence of the disease caused trouble in the bulb producing area, and ‘Arisa’ is expected to become the Savior. We are trying to create another strong tulip breed just like ‘Arisa’.

INTRODUCTION

Toyama prefecture is one of the largest tulip bulb producing areas in Japan. In Toyama, tulip bulb production started in 1918 with only ten bulbs. About 350 cultivars are produced now.

Recently, there have been occurrences of the tulip disease bulb rot, caused by *Fusarium oxysporum*. Tulip mild mottle mosaic disease has also occurred unusually. The occurrence of these diseases has caused trouble in the bulb producing area. So we have tried to breed a new tulip cultivar that is resistant to both diseases. ‘Arisa’, the new tulip cultivar has good characteristics, as this paper shows, and is expected to become an important cultivar for the future of bulb production in Toyama.

Breeding Process

We harvested 955 seedlings from a 1979 cross between ‘Don Quichotte’, which has tyrian rose flower color and strong stem and leaves, and ‘Ben van Zanten’, which has adaptability for forcing. From these 955 seedlings, 8 lines were selected in 1985. ‘Arisa’ was selected from these lines and multiplied. It was tested for 3 years in national license examinations starting in 1999. The tests were done at Hokkaido, Niigata, Saitama, Ibaraki, Aichi, Tottori and Fukuoka prefecture. ‘Arisa’ was registered in 2002 as Tulip Norin No. 23 by the Ministry of Agriculture, Forestrries and Fisheries, Japan.

MATERIALS AND METHODS

Bulbs, 11 cm in circumference, were used to determine characteristics of aerial part and 9 cm bulbs were used for bulb yield test. Bulbs were planted in the field in late autumn each year. To determine adaptability for forcing, 11 cm bulbs were precooled at 15°C for 2
weeks from August 15 and chilled at 5°C for 8 weeks. After chilling, the bulbs were planted in a greenhouse, where temperature was kept at 15 to 25°C and grown to flower. Experiments were conducted to determine resistance to bulb rot. Bulbs (7-9 cm) were dipped in a suspension (5 x 10^5/ml of bud cells) of *Fusarium oxysporum* before planting. Bulbs were harvested in June of the following year. They were dried quickly, stored under ordinary conditions and examined in August. To evaluate the degree of resistance to tulip mild mottle mosaic virus (TMMMV), bulb lots were planted and cultivated in a field infested with the disease for 2 years, then cultivated another year in pots of un-infested soil. TMMMV infection in peduncles of tulip plants was examined every year when the tulip flowered, using tissue blot immunoassay. We used ‘Barcelona’ as the check variety.

RESULTS AND DISCUSSION

**Flower**

‘Arisa’ has a single flower and the colour of flower is wine red (R.H.S. colour chart: 71B), with purplish pink edges (R.H.S. colour chart: 64C) (Fig. 1). It flowers in the middle of April in an ordinary year (Table 1). ‘Arisa’ is recommended for gardens, because of their strong stem and leaf (data not shown). This cultivar is also strong against wind and rain, and doesn’t change flower shape after flowering.

**Resistance to Diseases**

The resistance against bulb rot caused by *Fusarium oxysporum* and tulip mild mottle mosaic disease is high (Fig. 2, 3). The seed parent ‘Don Quichotte’ also has resistance against tulip mild mottle mosaic disease and shows low occurrence of bulb rot. This resistance seemed to succeed to ‘Don Quichotte’. ‘Arisa’ is expected to become the savior for these diseases.

**Bulb Yield**

On average, total bulb weight is 4 kg/100 plants and total bulb number is 349/100 plants. Thickening of main bulb is intermediate (Table 2). So it might be good for bulb production.

**Forcing**

‘Arisa’ has adaptability for forcing and produces all flowers before Christmas (Table 3). ‘Arisa’ is suitable for forcing as a cut flower.

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**Literature Cited**

Tables

Table 1. Characteristics of the aerial part on flowered day (average for 1999-2001).

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Flowering date</th>
<th>Petal length (cm)</th>
<th>Petal width (cm)</th>
<th>Stem length (cm)</th>
<th>Leaf length (cm)</th>
<th>Leaf number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arisa</td>
<td>25 Apr.</td>
<td>6.9</td>
<td>5.7</td>
<td>40.9</td>
<td>20.0</td>
<td>3.7</td>
</tr>
<tr>
<td>Barcelona</td>
<td>26 Apr.</td>
<td>7.6</td>
<td>5.6</td>
<td>39.9</td>
<td>17.9</td>
<td>3.6</td>
</tr>
</tbody>
</table>

Table 2. Bulb yield per 100 plants (average for 1999-2001).

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Number of bulbs (circumference in cm)</th>
<th>Total bulb number</th>
<th>Total bulb weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt;12 11 10 9-6 6&lt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arisa</td>
<td>31 51 16 69 182</td>
<td>349</td>
<td>4.00</td>
</tr>
<tr>
<td>Barcelona</td>
<td>67 29 3 11 129</td>
<td>239</td>
<td>3.97</td>
</tr>
</tbody>
</table>

Table 3. Adaptability for forcing (average for 1999-2001).

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Flowering rate (%)</th>
<th>Flowering day</th>
<th>Petal length (cm)</th>
<th>Stem length (cm)</th>
<th>Leaf length (cm)</th>
<th>First internode length (cm)</th>
<th>Cut flower weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arisa</td>
<td>100</td>
<td>18 Dec.</td>
<td>6.1</td>
<td>34.6</td>
<td>17.0</td>
<td>7.3</td>
<td>27.9</td>
</tr>
<tr>
<td>Barcelona</td>
<td>100</td>
<td>16 Jan.</td>
<td>7.0</td>
<td>39.1</td>
<td>14.5</td>
<td>5.6</td>
<td>30.0</td>
</tr>
</tbody>
</table>

Figures

Fig. 1. Aerial part of ‘Arisa’.  

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Fig. 2. Resistance to bulb rot.

Fig. 3. Resistance to tulip mild mottle mosaic disease.