BOOK OF ABSTRACT
Emerging Challenges and Opportunities in Horticulture Supporting Sustainable Development Goals

iSH 2018
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<table>
<thead>
<tr>
<th>Time</th>
<th>Location</th>
<th>Session Title</th>
<th>Presenters</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>09.30 - 10.30</td>
<td>Pucuk</td>
<td>Effectiveness of Dose Mycorrhizal Biofertilizer of Gigaspora sp on Growth and Yield of Some Chili Varieties in Inceptisol Krueng Raya Aceh Besar</td>
<td>Syafuddin, Syakur, Hasanuddin</td>
<td>71</td>
</tr>
<tr>
<td>09.30 - 10.30</td>
<td>Triple C</td>
<td>Induce Mutation Using Gamma Irradiation To Increase Variation On Potato (Solanum Tuberosum L.)</td>
<td>Ida Ayu Astarini¹, Debora Margareth², 1 Gde Rai Maya Temaja³, Juniarti P. Sahat⁴</td>
<td>72</td>
</tr>
<tr>
<td>09.30 - 10.30</td>
<td>Triple C</td>
<td>Application of Rhizobacteria for Controlling Twisted Disease of Shallot Cultivated in The Rainy Season</td>
<td>Yanti Rahmada, Wibowo Arif, Subandiyah Siti, Sulistyaningsih Endang, Harper Stephan</td>
<td>72</td>
</tr>
<tr>
<td>10.30 - 11.30</td>
<td>Pucuk</td>
<td>The Identification and Expression Studies of Nitrate Transportase Gene NRT2.1 of Shallot cv Probolinggo</td>
<td>Lindawati Ema, Kusumawati Dinihari Indah, Sulistyaningsih Endang, Wibowo Arif, Harper Stephen, Purwesti Yekti Asih, Subandiyah Siti</td>
<td>73</td>
</tr>
<tr>
<td>10.30 - 11.30</td>
<td>Pucuk</td>
<td>True Seed Of Shallots (Tss) Technology Development Progress In Indonesia</td>
<td>Adhitya Marendra Kiloes; Puspitasari; Rini Rosliani</td>
<td>74</td>
</tr>
<tr>
<td>11.05 - 13.30</td>
<td>Kunyit Resto</td>
<td>Friday Prayer and Lunch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>07.30 - 08.30</td>
<td>Pucuk</td>
<td>Local Wisdom Of Garlic Cultivation In Sembalun Highland Of Lombok Island - Indonesia</td>
<td>Mardiana; Utami, Sylvia K; Hidayah, Baiq Nurul</td>
<td>111</td>
</tr>
<tr>
<td>07.30 - 08.30</td>
<td>Pucuk</td>
<td>Determinants of Agricultural Credit Participation of Vegetable's Smallholder Farmers in East Java</td>
<td>Hartono, Rachman; Toiba, Hery; Nugroho, Tri Wahyu</td>
<td>111</td>
</tr>
<tr>
<td>07.30 - 08.30</td>
<td>Pucuk</td>
<td>Preliminary Studies on Production, Post-Harvest and Marketing of Kaifir Lime (Citrus hystrix DC) in Tulungagung</td>
<td>Rahmat Budiarto, Roedhy Poerwanto, Edi Santosa, Darda Efendi, Andria Agusta</td>
<td>112</td>
</tr>
<tr>
<td>07.30 - 08.30</td>
<td>Pucuk</td>
<td>Barrier Factors for Indonesian Smallholder Farmers in Exporting Mangosteen (Garcinia mangostana, L) from Indonesia to Global Market</td>
<td>Khaririyatun Nur, Mansyah Ellina</td>
<td>112</td>
</tr>
<tr>
<td>07.30 - 08.30</td>
<td>Pucuk</td>
<td>The Role of Woman in Potato Farming in Central Java</td>
<td>Prasetianti, Dwinta; Jatuningtyas, Ratih Kurnia; Cempaka, Intan Gilang; Triastono, Joko</td>
<td>113</td>
</tr>
</tbody>
</table>
Induce Mutation Using Gamma Irradiation to Increase Variation on Potato (Solanum tuberosum L.)

Ida Ayu Astarini\*1, Debora Margareth1, I Gde Rai Maya Temaja2, and Juniarti P. Sahat3

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E-mail: iastarini@unud.ac.id

Abstract. Potato is one of important vegetable crop in Indonesia. There are limited varieties available in Indonesia when compared to potato varieties overseas. Introducing potato from overseas often failed as the new potato varieties were not adapted to tropical countries. Plant breeding is important method in producing new variety of potato. One of the new methods is using induce mutation. This study was aimed to increase variation on potato plantlets after exposure to varied doses of Gamma irradiation. Potato shoots was introduced in vitro culture. In vitro potato plantlets variety RG101 were exposed to gamma irradiation with the dose of 0 Gy, 20 Gy and 40 Gy. Irradiator Gamma cell - 220 RGH 101 was employed to irradiate the potato plantlets. Dosage rate was 134,871 Gy per hour. With active element of 60 Cobalt was employed to irradiate the potato plantlets. After exposure to gamma rays, plantlets were subculture on single node and planted on MS media without hormone. Observation was done every two weeks. Results show that control plantlets shows best growth rate. Plantlet treated with gamma irradiation produced abnormal growth. A number of plantlet exposed to 20 Gy gamma irradiation produced purple leaves, and longer leaves. Dose of 40 Gy causing retarded plantlet growth and even plantlet died.

Keywords: in vitro, potato plantlet, mutation breeding

Application of Rhizobacteria for Controlling Twisted Disease of Shallot Cultivated in The Rainy Season

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2The University Queensland and O-DAF, Australia
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Abstract. Shallot is a high value horticultural commodity in Indonesia. However, shallot production in Indonesia still can not meet national demand. One effort to increase the production of shallot is by planting in the rainy season, but it will meet various problems. One of the problems is the attack of Fusarium spp. which causing of twisted disease. The purpose of this research was to know the effectiveness of rhizobacteria application to suppress twisted disease and increasing the growth of shallot cultivated in the rainy season. The research was conducted in December 2017 to April 2018 in shallot field in Parangtritis village, Kretak, Bantul, Yogyakarta. The experiment design was complete randomized block design with 7 treatments and 3 blocks as replications. The rhizobacteria used were Bacillus amyloliquofaciens (BrSG 5), Burkholderia cepacia (BrSM 4), isolates Bacillus methylotherophus (Bp25.7) and Bacillus amyloliquofaciens (Bp25.6) which recently were effectively reduce the incidence of twisted disease in glass house study. Trichoderma and sterile water as control. The data result of the research was analyzed and bulb weight were not significantly different, but rhizobacteria application could suppress the incidence of twisted disease and increase the production of shallots with the best isolates was Bacillus amyloliquofaciens (BrSG.5).

Keywords: Shallot, twisted disease, rainy season, rhizobacteria
Certificate of Attendance

This is to certify that Ida Ayu Astarini has participated as Presenter at the INTERNATIONAL SYMPOSIUM ON HORTICULTURE 2018 held on November 27 - 30, 2018 at the Anvaya Beach Hotel Kuta - Bali, Indonesia.

Dr. Hardiyanto, M.Sc
Director of ICHORD

INDONESIAN CENTER FOR HORTICULTURAL RESEARCH AND DEVELOPMENT
Ministry of Agriculture

Emerging Challenges and Opportunities in Horticulture: Supporting Sustainable Development Goal
Induce Mutation Using Gamma Irradiation to Increase Variation on Potato (Solanum tuberosum L)

Ida Ayu Astarini, D. Margareth, I G. R. M. Temaja, Juniarti P. Sahat
Udayana University, Indonesian Vegetables Research Institute
Introduction

- Potato is one of the main carbohydrate sources around the world, including Indonesia.
- Limited number of varieties.
- In Bali, only ‘Granola’
- Induce mutation using gamma rays is an alternative method to induce variation in potato.
Study aim

- To investigate gamma irradiation effect on in vitro plantlet of RGH 01
- To find out Gamma irradiation effect on in vivo/tuber Granola L and Vega yield
- Long term aim: to produce mutant with special/interesting characteristics
Method

- **Time:** May – October 2018

- **Place:**
  - In vitro culture and field trial was done at Indonesian Vegetables Research Institute, Lembang.
  - Irradiasi using Gamma ray was done at Laboratorium Pusat Aplikasi Isotop dan Iradiasi (PAIR), BATAN, Pasar Jumat, Jakarta Selatan. (Gamma cell – 220)
Method

- **In vitro**
  - Variety RGH01 (natural variant of Granola from Garut)
  - Dose: 0, 20 Gy, 40 Gy
  - 6 plantlet each treatment.
  - After treatment, plantlets were subculture. One plantlet cut into 3 stems per jar.
  - Culture media: MS 0

- **In vivo**
  - Two varieties: Granola L and Vega
  - Dose: 0 Gy, 25 Gy, dan 50 Gy
  - Early generation tuber, 15 tubers per variety were exposed to Gamma ray
## Results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>2 week</th>
<th></th>
<th></th>
<th>4 week</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 Gy</td>
<td>20 Gy</td>
<td>40 Gy</td>
<td>0 Gy</td>
<td>20 Gy</td>
<td>40 Gy</td>
</tr>
<tr>
<td>% plantlet growth</td>
<td>75,93</td>
<td>29,62</td>
<td>18,52</td>
<td>62,96</td>
<td>18,52</td>
<td>0</td>
</tr>
<tr>
<td>% plantlet retarded</td>
<td>0</td>
<td>27,78</td>
<td>31,48</td>
<td>0</td>
<td>14,82</td>
<td>37,08</td>
</tr>
<tr>
<td>% plantlet browning/dead</td>
<td>9,26</td>
<td>24,07</td>
<td>27,78</td>
<td>9,26</td>
<td>24,07</td>
<td>35,18</td>
</tr>
<tr>
<td>% plantlet contaminated</td>
<td>14,81</td>
<td>18,52</td>
<td>22,22</td>
<td>27,78</td>
<td>24,07</td>
<td>27,78</td>
</tr>
</tbody>
</table>

Low percentage of plant survive/grow, shows that potato plantlets has high radiosensitivity (Herison *et al.*, 2008).
• Purple leaves were observed after 2 weeks in culture
At 4 weeks

- Slow growth
- Branching
- No root growth
## In vivo results

<table>
<thead>
<tr>
<th>Variety</th>
<th>Survival rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 Gy</td>
</tr>
<tr>
<td>Granola L</td>
<td>66.67 %</td>
</tr>
<tr>
<td>Vega</td>
<td>100 %</td>
</tr>
<tr>
<td></td>
<td>Granola L</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td>0 Gy</td>
</tr>
<tr>
<td>Average tuber weight</td>
<td>549.55</td>
</tr>
<tr>
<td>(gram)</td>
<td></td>
</tr>
<tr>
<td>Average tuber number</td>
<td>22.50</td>
</tr>
</tbody>
</table>

- Non irradiated tubers (control) plants has the highest yield.
- ‘Vega’ performed better than ‘Granola L’, on control and 25 Gy irradiation.
- ‘Vega’ could not stand for high dose gamma irradiation (50 Gy). Tuber became cracked and crunch.
Harvested tuber: Vega

- 25 Gy irradiation dose resulted on varied tuber shape – fingerling
- Darker skin colour tuber were found

- 25 Gy irradiation dose:
  - Tuber aberration - dead
**Granola L harvest**

- **25 Gy irradiation dose:** varied tuber shape, some are longer/fingerling

- **50 Gy irradiation dose:** varied tuber shape, very low yield
Conclusion

- Gamma irradiation decrease survival both on in vitro and in vivo.
- Increase variation occurred both in vitro and in vivo.
- In vitro variation: purple colour leaves.
- In vivo variation: new shape – long, darker colour skin, small size potato.
- Potential for further study to produce new variety particularly new shape.
Thanks to

• DIKTI, Balitsa staf, Debora