This data deals with the optimization of microprojectile bombardment particles for efficient genetic transformation in an indica rice involving AmSOD gene for development of salinity tolerant transgenic lines [1]. In this study, various parameters such as effect of genotypes, helium pressure, osmoticum, explants, flight distance, particle size, particle volume, vacuum, carrier DNA and stopping screen properties have been evaluated to determine their role in transformation of indica rice involving AmSOD gene for development of salinity tolerant Pusa Basmati 1 rice variety. To perform the transformation process, plasmid vector pCAMBIA 1305.2 was used, which harbours GUS Plus™ gene, intron from the castor bean catalase gene, pBR322 ori, kanamycin resistant gene and Xho I site. The transformants have
been confirmed using slot blot, polymerase chain reaction and Southern hybridization techniques.

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Specification Table

| Subject                      | Section: 1 Agricultural and Biological Sciences |
|------------------------------|-----------------------------------------------|
| Specific subject area        | Agricultural Biotechnology intervention made through optimization of microprojectile bombardment particles for efficient transformation in indica rice variety for enhanced tolerance to salinity. |
| Type of data                 | Table                                          |
| How data were acquired       | Data were required using the Microprojectile instrument PDS-1000/He system [Bio-Rad, USA (Sanford, 1993)] Based on in vitro culture response only one suitable variety Pusa Basmati 1 among three was selected and subjected to transgenic development involving AmSOD gene. Data were recorded to detect the optimized condition for maximum transient gene expression involving pCAMBIA1305.2 in respect of diverse microprojectile bombardment parameters (physical, chemical and biological). Transient gene expression data through GUS histochemical assay was used and the data were analyzed through statistical software (Microsoft Excel) [2,3]. |
| Data format                  | Analyzed                                       |
| Parameters for data collection | In assessing the in vitro culture response to select the most suitable variety with prolific plantlet regeneration, data like callus induction (%), callus proliferation (w/w%), callus health (1–9 scale), shootlet regeneration (%), shootlet health (1–3 scale), root induction (%), hardening (%) and total plantlets grown to maturity were recorded. Similarly, in assessing the role of diverse physical, chemical and biological factors in influencing the transient GUS expression was assessed through GUS histochemical assay [4] involving bombarded calli with binary vector pCAMBIA1305.2 to detect the appropriate condition for microprojectile bombardment involving economically important gene AmSOD [5] in Pusa Basmati 1, especially at the interface of hypervariable climate. |
| Description of data collection | Calli were induced by culturing axenic seeds on MS medium [6] supplemented with suitable hormones, which were excised and proliferated on callus proliferation medium containing half dose of 2mg/l 2,4-D as growth regulator was used in the callus induction medium to induce fast growing embryogenic calli. Here in detecting the in vitro culture response to select the most suitable variety with prolific plantlet regeneration, callus induction (%), callus proliferation (w/w%), callus health (1–9 scale), shootlet regeneration (%), shootlet health (1–3 scale), root induction (%), hardening (%) and total plantlets grown to maturity were recorded. Similarly, in assessing the effect of diverse physical, chemical and biological factors in influencing the transient GUS expression was assessed through GUS histochemical assay [4] involving bombarded calli with a modern binary vector pCAMBIA1305.2 to detect the appropriate condition for successful microprojectile bombardment with maximum transformants with an important gene AmSOD tolerant to salinity in Pusa Basmati 1 [7]. |
| Data source location         | Institution: ICAR-Central Agricultural Research Institute, City: Port Blair 744105 Country: India |
| Data accessibility           | Latitude and longitude: 11.6234° N, 92.7265° E Data can be accessible with related research article. |
| Related research article     | S. Sarangi, C. Mandal, S. Dutta, P. Mukherjee, R. Mandal, S. P. Jeevan Kumar, P. R. Choudhury, V.P. Singh, D.K. Tripathi, A.B. Mandal, Microprojectile based particle bombardment in development of transgenic indica rice involving AmSOD gene to impart tolerance to salinity, Plant Gene, 19 (2019) 100183, https://doi.org/10.1016/j.plgene.2019.100183. |
1. Data

Data pertinent to influential parameters such as effect of genotypes, helium pressure, osmoticum, explants, flight distance, particle size, particle volume, vacuum, carrier DNA and stopping screen properties have been evaluated [1] to determine their role in transformation of indica rice involving $\text{AmSOD}$ gene for development of salinity tolerant Pusa Basmati 1 rice variety (Table 1).

Fig. 1 depicts the effect of genotype on transformation efficiency. Fig. 2 illustrates the role of helium pressure on transformation efficiency [a) 640 psi, b) 900 psi, c) 1100 psi, d) 1350 psi, and e) 1500 psi].

Effect of osmoticum (0.4 M mannitol) in inducing transformation efficiency for different period [a) 4 h, b) 8 h, and c) 16 h (Fig. 3)].

Fig. 4 illustrates the effect of osmoticum (0.2 M mannitol + 0.2 M sorbitol) combination for varied time duration a) 4 h; b) 8 h; and c) 16 h.

Fig. 5 demonstrates the role of explants for regeneration of transformant [a) Mature seed embryo derived primary callus, b) Immature embryos, and c) Mature seed embryo derived secondary callus.

Fig. 6 depicts the effect of flight distance in governing GUS expression of proliferating calli of Pusa Basmati 1 [a) 6 cm, b) 9 cm and c) 12 cm].

Fig. 7 demonstrates the role of microcarrier (gold particles) in transforming the Pusa Basmati-1 [a) 0.6 $\mu$m, b) 1.0 $\mu$m and c) 1.6 $\mu$m].

Fig. 8 illustrates different volumes of DNA coated microcarriers [a) 3 $\mu$l; b) 6 $\mu$l; c) 10 $\mu$l and d) 15 $\mu$l].

Fig. 9 demonstrates the GUS expression in bombarded calli of Pusa Basmati 1 [a) Control, b) Salmon sperm DNA, c) Calf thymus DNA and d) Herring sperm DNA.

2. Experimental design, materials, and methods

2.1. Effect of genotypes

To determine the effect of genotypes on transformation efficiency three genotypes have been evaluated, of which Pusa Basmati 1 was selected for further experiments (Fig. 1).

2.2. Effect of helium pressure

Effect of helium pressure was determined using PDS He 2000 microprojectile instrument (Bio-Rad, USA). Five pressure levels ie., 640–1550 psi have been used in bombardment of 100 randomly selected calli. After completion of 48 h the transient expression of introgressed gene has been determined by GUS expression (Fig. 2).

2.3. Effect of osmoticum

To reduce cell viability and sometime necrosis, osmoticum like manitol (Sigma-Aldrich Cat No. M4125) was used to increase the osmolarity. 0.4 M manitol supplemented in the bombardment
| Genotype          | Parameter                  | Range of callus size (mm²) | Average callus size (mm²) | Range of GUS spots/callus | Av No of GUS spots/callus | Range (No. GUS spots/mm²) | Average GUS spots/mm² | GUS staining pattern in bombarded calli | Remarks                        |
|-------------------|----------------------------|-----------------------------|---------------------------|---------------------------|---------------------------|---------------------------|-----------------------|----------------------------------------|---------------------------------|
| **Pusa Basmati 1**| 1. Helium Pressure (psi in inch) |                             |                           |                           |                           |                           |                       |                                        |                                 |
|                   | 640                         | 3.0–5.0                     | 4.05                      | 1–29                      | 9.20                      | 0.25–9.66                 | 2.55                  | Faint:1.3 (26.03) Mod:4.1 (36.82) Intense: 3.8 (37.09) | Maximum GUS expression           |
|                   | 900                         | 3.0–5.0                     | 3.80                      | 1–34                      | 12.10                     | 0.33–7.0                  | 5.61                  | Faint:5.6 (45.18) Mod:2.9 (20.06) Intense:3.6 (37.74) |                                 |
|                   | 1100                        | 3.0–5.0                     | 3.45                      | 0–52                      | 15.70                     | 0–13                     | 4.63                  | Faint:2.1 (10.37) Mod:7.4 (49.35) Intense:6.2 (30.22) Faint:3.7 (25.30) Mod:4.1 (38.08) Intense:5.8 (26.54) Faint:2.7 (33.90) Mod:3 (42.90) Intense:2.8 (28.13) | Maximum GUS expression           |
|                   | 1350                        | 2.5–4.0                     | 3.55                      | 0–44                      | 11.31                     | 0.25–8.0                  | 2.35                  | Intense: 1.6 (10.18) Mod:7.1 (44.12) Faint:5.3 (44.60) Intense:4.0 (27.38) Mod:14.8 (42.40) Faint:4.2 (24.56) Intense:3.5 (19.09) Mod:4 (33.60) Faint:7.2 (27.20) | Maximum GUS expression           |
|                   | 1550                        | 2.5–4.5                     | 3.50                      | 1–24                      | 7.91                      | 0–7.2                    | 2.86                  |                                        |                                 |
| **2. Particle Size (μ) | 0.6                         | 2.5–5.0                     | 3.72                      | 2–4.5                     | 14.81                     | 0.57–11.25                | 3.76                  |                                        |                                 |
|                   | 1                           | 3.0–5.0                     | 3.65                      | 5–35                      | 15.52                     | 1.01–1.61                 | 4.66                  |                                        |                                 |
|                   | 1.6                         | 2.5–4.0                     | 3.45                      | 0–29                      | 10.31                     | 0.25–10.67                | 3.21                  |                                        |                                 |
| **3. Particle volume (μl) | 3                           | 2.5–4.5                     | 3.35                      | 0–59                      | 17.71                     | 0–19.52                  | 5.45                  |                                        |                                 |
|                   | 6                           | 2.0–4.0                     | 2.80                      | 0–58                      | 13.42                     | 0–23.21                  | 5.77                  |                                        |                                 |
|                   | 10                          | 2.0–4.0                     | 3.25                      | 5.5–89                    | 32.41                     | 3.02–25.4                | 10.2                  |                                        | Maximum GUS expression           |
| 15 | 25.40 | 3.45 | 6–38 | 32.32 | 1.71–20.25 | 9.18 |
|----|-------|------|------|-------|-----------|-----|
|     |       |      |      |       |    Intense: 3 (16.66) Mod: 5 (28.78) Faint: 12 (66.61) |

| Flight distance (cm) |
|----------------------|
| 6                    |
| 3.0–6.0              |
| 4.50                 |
| 3–61                 |
| 22                   |
| 0.5–20.33            |
| 6                    |

| 9 | 3.0–6.0 | 4.25 | 1–57 | 28.60 | 0.33–12.6 | 6.34 |

| 12 | 3.0–6.0 | 4.05 | 0–39 | 14.01 | 0–8.6 | 3.54 |

| Internal vacuum pressure of chamber (Hg⁻⁻) |
|-------------------------------------------|
| 15 | 2–3.5 | 2.80 | 0–9  | 1.91  | 0–3   | 0.74 |

| 20 | 2.5–4.0 | 3.35 | 0–21 | 7.50  | 0–6   | 1.81 |

| 25 | 2.0–4.0 | 3.15 | 1–4  | 21.91 | 0–25  | 6.99 |

| 28 | 2.0–3.5 | 2.91 | 0–72 | 31.72 | 0–24  | 10.87 |

| 30 | 2.0–4.0 | 3.05 | 0–63 | 30.50 | 0–21  | 9.86 |

| Stopping screen position (cm) |
|--------------------------------|
| 6 (Upper Most) |
| 2.0–3.5 | 2.63 | 0–74  | 34.50 | 0–22  | 12.2 |

| 9 (Middle) |
| 2.0–3.0 | 2.44 | 6–57  | 30.01 | 2.4–22.8 | 12.5 |

| 12 (Lower Most) |
| 2.0–3.0 | 2.75 | 0–79  | 42    | 0–31.62 | 23.84 |

| Maximum GUS expression |
|-------------------------|
| (continued on next page)
| Genotype                  | Parameter          | Range of callus size (mm²) | Average callus size (mm²) | Range of GUS spots/callus | Av No of GUS spots/callus | Range (No. GUS spots/mm²) | Average GUS spots/mm² | GUS staining pattern in bombarded calli | Remarks                      |
|--------------------------|--------------------|-----------------------------|----------------------------|---------------------------|--------------------------|---------------------------|------------------------|------------------------------------------|-------------------------------|
|                          |                    |                             |                            |                           |                          |                           |                        |                                          |                                |
| **A.0.4M Manitol**        |                    |                             |                            |                           |                          |                           |                        |                                          |                                |
| 4 h                      |                    | 2.0–4.5                     | 2.95                       | 0–53                      | 19.81                    | 0–26.51                   | 7.93                   | Deep: 7.5 (28.86) Med: 6.6 (26.20) Faint: 12.7 (62.80) | Maximum GUS expression        |
| 8 h                      |                    | 2.02–4.5                    | 2.90                       | 2.47–22.11                | 20.10                    | 0.66–23.5                 | 8.86                   | Deep: 2.4 (12.66) Med: 5.0 (25.15) Faint: 12.7 (62.80) |                                |
| 16 h                     |                    | 4–62                        | 19.2                       | 2.02–4.50                 | 2.85                     | 2.0–2.61                  | 6.96                   | Deep: 8.2 (28.68) Med: 4.0 (8.20) Faint: 7 (46.70) |                                |
| **B.0.2M Manitol + 0.2M Sorbitol** |            |                             |                            |                           |                          |                           |                        |                                          |                                |
| 4 h                      |                    | 1–31                        | 14.91                      | 3.0–4.5                   | 3.56                     | 0.22–9.66                 | 4.36                   | Deep: 3.5 (38.00) Med: 5.7 (41.20) Faint:4.2 (26.01) | Maximum GUS expression        |
| 8 h                      |                    | 2.02–4.0                    | 3.21                       | 0–37                      | 14.66                    | 0–18.51                  | 5.41                   | Deep: 6.1 (31.60) Med: 3.8 (23.20) Faint: 4.8 (26.01) |                                |
| 16 h                     |                    | 2.5–4.0                     | 3.45                       | 0–32                      | 11.55                    | 0–9.14                   | 3.38                   | Deep: 2.7 (23.70) Med: 3.8 (23.60) Faint: 4.9 (39.47) |                                |
| **1.Genotype**           |                    |                             |                            |                           |                          |                           |                        |                                          |                                |
| Pusa Basmati 1           |                    | 2.05–4.0                    | 3.40                       | 0–41                      | 13.71                    | 0–13.66                  | 4.08                   | Intense:4.6 (28.72) Mod:3.6 (17.86) Faint:5.5 (38.03) | Maximum GUS expression        |
| Taraori Basmati          |                    | 2.5–4.0                     | 3.50                       | 0–60                      | 22.00                    | 0–17.00                  | 6.21                   | Intense:5.2 (16.95) Mod:8.3 (38.95) Faint:8.3 (38.95) |                                |
| IR70485-15-3-2(NPT/Superrice) |                | 3.0–4.5                     | 4.05                       | 0–64                      | 15.50                    | 0–14.20                  | 3.54                   | Intense:6.2 (18.56) Mod:6.6 (49.02) Faint:2.7 (22.04) |                                |
| **2.Explant**            |                    |                             |                            |                           |                          |                           |                        |                                          |                                |
| Immature embryo          |                    | 1.2–2                       | 1.71                       | 0–65                      | 39.90                    | 0–21.6                   | 11.7                   | Intense:14.7 (25.93) Mod:15.4 (36.69) Faint:9.8 (17.96) |                                |
| Type                  | Range | Intensity |    |    |   |
|----------------------|-------|-----------|----|----|---|
| Primary Callus       | 2–3   | 2.61      | 9.0–46 | 25.52 | 3.0–23.0 | 10.36 |
| Secondary Callus     | 1–2   | 1.71      | 4–76  | 26.61 | 2.5–57.00 | 16.8 |
| **3. Biological Adjuvant** (Carrier DNA) |       |           |       |       |   |
| Control              | 2.0–3.5 | 2.65     | 4–43  | 22.9 | 1.33–17.01 | 9.77 |
| Salmon Sperm DNA     | 2.0–3.5 | 2.95     | 0–72  | 20.8 | 0–23.51 | 7.69 |
| Calf Thymus DNA      | 2.0–3.5 | 2.55     | 0–49  | 17.9 | 0–24.50 | 7.50 |
| Herring Sperm DNA    | 2.0–3.5 | 2.55     | 0–42  | 17.71 | 0–21.01 | 7.28 |

a Differential GUS intensity in bombarded calli samples, figure within parenthesis indicates percent value.
b Mod: Moderate.

Maximum GUS expression

- Intense:9.3 (34.15) Mod:9.0 (34.03) Faint:7.2 (31.63)
- Intense: 6.7 (18.10) Mod:9.4 (34.06) Faint:10.5 (43.82)
- Intense:9.01 (45.00) Mod:6.0 (38.00) Faint:5.01 (25.00)
- Intense: 7 (35.00) Mod:10 (50.00) Faint:3 (15.00)
- Intense: 8 (40.00) Mod:6 (30.00) Faint:6.5 (31.00)
- Intense:3 (15.00) Mod:10 (50.00) Faint:7 (35.00)
medium was used for culture of primary calli (size 2.0—4.5 mm² with average of 2.95 mm²) of all three varieties for 4, 8, 16 h (Table 1 and Fig. 3). Dual osmoticum treatments with manitol and sorbitol (0.2 M) were also studied for pre-incubation as shown in (Table 1 and Fig. 4).

2.4. Effect of explants

To identify most suitable one, different explants were bombarded and GUS expression was recorded under stereo zoom microscope (Nikon, Japan) (Table 1). Secondary calli was used as suitable explants for microprojectile bombardment for transgenic development (Fig. 5).
Fig. 2. GUS expression in highly proliferating bombarded calli of Pusa Basmati 1 under different levels of He pressure in the internal chamber. Legends: a) 640 psi; b) 900 psi; c) 1100 psi; d) 1350 psi; and e) 1500 psi.
2.5. Effect of flight distance

Microcarrier velocity is intimately related to air resistance that governs transgene delivery and its expression in the recipient system. In the present experiment three flight distances viz. 6, 9, and 12 cm were used to bombard primary calli of 3.0–6.0 cm size with average of 4.5 cm (Table 1 and Fig. 6).

Fig. 3. Differential GUS expression in bombarded calli of Pusa Basmati 1 at osmoticum induced by using 0.4 M mannitol singly for different time duration. Legends: a) 4 h; b) 8 h; and c) 16 h.
Fig. 4. GUS expression pattern in proliferating bombarded calli of Pusa Basmati 1 at osmoticum created by using 0.2 M mannitol + 0.2 M sorbitol in combination for varied time duration. Legends: a) 4 h; b) 8 h; and c) 16 h.
2.6. Effect of particle sizes

Inert gold microcarriers of three different diameters viz. 0.6, 1.0, and 1.6 μm (Bio-Rad, USA) were used to achieve maximum transgene delivery and transient expression of the reporter gene involving primary calli [size range: 2.5–5.0 mm² (average: 3.7 mm²)] (Table 1 and Fig. 7).

Fig. 5. Varied GUS expression in proliferating bombarded calli derived from different explants of Pusa Basmati 1. Legends: a) Mature seed embryo derived primary callus; b) Immature embryos; and c) Mature seed embryo derived secondary callus.
Fig. 6. Effect of flight distance in governing GUS expression in bombarded proliferating calli of Pusa Basmati 1. Legends: a) 6 cm; b) 9 cm; and c) 12 cm.
2.7. Effect of particle volume

In the present study, four volumes viz. 3, 6, 10 and 15 μl particle volume were used to bombard primary calli (range: 2.5–4.0 mm²; average: 3.35 mm²) (Table 1 and Fig. 8).

2.8. Effect of vacuum

In this experiment, 5 internal vacuum pressure viz. 15”, 20”, 25”, 28” and 30” of Hg were used in bombarding proliferative calli of the size range: 2.02–3.5 mm (average: 2.8 mm²) (Table 1).
2.9. Effect of stopping screen position

In this study, bottom, middle and top most positions for placement of stopping screen were used in bombarding calli of size range: $2.0 \times 3.5 \text{ mm}^2$ and average: $2.6 \text{ mm}^2$ (Table 1).

2.10. Effect of carrier DNA

To safe guard the intruded DNA from endogenous nuclease inside the recipient calli, Salmon Sperm DNA, Calf thymus DNA, Herring sperm DNA were used as coating material of the microcarriers along with plasmid DNA (pCAMBIA 1305.2 ref.website) in 1:1 ratio. Primary calli of $2.0 - 3.0 \text{ mm}$ size with average of $2.5 \text{ mm}^2$ diameters were bombarded (Fig. 9) (Table 1).

**Fig. 8.** GUS expression in bombarded calli of Pusa Basmati 1 using different volumes of DNA coated microcarriers. Legends: a) 3 µl; b) 6 µl; c) 10 µl and d) 15 µl.
Acknowledgement

Authors acknowledge the generous gift of plasmid construct (pCAMBIA1305.2) from Centre for the Application of Molecular Biology to International Agriculture (CAMBIA), Canberra, Australia and

Fig. 9. Varied GUS expression in bombarded calli of Pusa Basmati 1. Legends: a) Control; b) Salmon sperm DNA; c) Calf thymus DNA and d) Herring sperm DNA.

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Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dib.2020.105305.

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