



Effect Of Seed Mycoflora (*Drechslera oryzae*) On Seed Quality Parameters Of Popular Rice (*Oryza sativa* L.) Cultivars

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ABSTRACT

Seed quality parameters viz., germination and seed vigour were reduced while moisture content was increased in rice seed samples inoculated with D. oryzae over uninoculated rice seed samples collected from different locations. Seed germination was found high in the rice cv. WGL 14 (77.2%) followed by RNR 15048 (75.5%), Siddhi (74%) and JGL 11470 (74%), whereas the lowest seed germination was found in BPT 5204 (64.2%) followed by JGL 3828 (66.2%) and RP Bio 226 (67.5%). Highest SVI - I was found in the variety WGL 14 (1371) followed by RNR 15048 (1160) and JGL 18047 (1053) whereas the lowest SVI - I was found in BPT 5204 (635) followed by RP Bio 226 (713) and JGL 3855 (718). The highest SVI - II was found in WGL 14 (1145) followed by RNR 15048 (1113) and JGL 18047 (1005) whereas the lowest SVI - II was found in susceptible checks viz., BPT 5204 (546) followed by RP Bio 226 (641) and MTU 1010 (651). Rice cultivars viz., JGL 3828 and BPT 5204 recorded high moisture content (13.5%) followed by JGL 3855 (12.5%) whereas low moisture content was found in the rice cv. Sumati (10%) followed by WGL 14 (10.4%) and RNR 15048 (10.5%).

KEY WORDS: *D. oryzae*, seed germination, seedling vigour index, moisture content.

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INTRODUCTION:

For successful crop production, the seed must be sound and free from seed mycoflora which interfere with seed germination, emergence and subsequent performance of the crop in the main field. Under field conditions, seeds are known to harbour several fungi which affect their health seriously causing germination failure and partial to complete death of seedlings. Seedborne pathogens reduce seed viability and vigour both in storage and field conditions and cause yield losses subsequently in the field (Anuja and Aneja, 2000).

MATERIALS & METHODS:

A total of eighteen rice seed samples were collected from three major rice growing districts of Telangana State viz., Warangal (Agricultural Research Station) (3 Nos), RangaReddy (Agricultural Research Institute) (4 Nos), Karimnagar (Regional Agricultural Research Station) (7 Nos) and susceptible cultivars (checks) (4 Nos) (Indian Institute of Rice Research). Seed samples were analyzed for seed health parameters. The spore suspension of *D. oryzae* was prepared from 8 - 10 day old culture using sterile distilled water and mixed thoroughly by using vortex mixer (Neolab vortex mixer) for five minutes to separate spores from mycelia. The suspension was filtered through cheese cloth and concentration of spores was adjusted to 1×10^9 spores/ml. Four hundred seeds of each rice sample were surface sterilized with 1% sodium hypochlorite solution for 3 min and washed in 2-3 changes of sterile distilled water and dried between blotters and soaked in 25 ml of spore suspension of pathogen for 2 h. The inoculated seeds were tested for germination and seedling vigour index.

Seed germination (%)

The germination per cent was assessed by adopting rolled paper towel method as prescribed by International Seed Testing Association Rules (ISTA, 1996). Germination paper towels of standard size (440 × 330) were dipped in sterile distilled water and drained. Hundred seeds of each rice seed sample

were distributed at equidistance. Another towel similarly was laid over and labelled. The towels were then rolled, drained of excess water, placed in aerated polythene bag and incubated in an upright position at $28 \pm 2^\circ\text{C}$ in a BOD incubator. Four hundred seeds with hundred seeds in each replication were examined for each treatment. On fourteenth day, germination percentage was recorded.

$$\text{Germination (\%)} = \frac{\text{Number of normal seedlings}}{\text{Total number of seeds}} \times 100$$

Seedling vigour

Seedling vigour was assessed by measuring length of the seedlings as per the method given by Abdul-Baki and Anderson (1973) and dry weight (ISTA, 1996).

Ten normal seedlings from each replication of germination test were taken separately for measuring seedling length in centimeters (cm). The seedling length comprises of root length and shoot length. The same seedlings which were taken for measuring seedling length were oven dried in an hot air oven at 60°C for 24 h for obtaining seedling dry weight and expressed in milligrams (mg).

Seedling vigour index I and II were calculated using the formula given by Abdul Baki and Anderson (1973).

$$\text{SVI I} = \text{Seedling length (cm)} \times \text{Germination percentage (\%)}$$

$$\text{SVI II} = \text{Seedling dry weight (mg)} \times \text{Germination percentage (\%)}$$

Seed moisture content

Moisture content was assessed by oven method by drying the seed samples (10 grams each) after grinding at the temperature of $130 - 133^\circ\text{C}$ for 2 h. The moisture content in percentage was calculated by using the formula

$$M = \frac{M_2 - M_3}{M_2 - M_1} \times 100$$

$$M_1 = \text{Weight of empty cover (g)}$$

$$M_2 = \text{Weight of cover with seed before drying (g)}$$

$$M_3 = \text{Weight of cover with seed after drying and cooling (g)}$$

RESULTS & DISCUSSION

Effect of *D. oryzae* on seed germination (%) of popular rice cultivars

Seed germination among different rice cultivars was ranged from 64.2 % to 77.2 %. Germination was significantly reduced by inoculation with *D. oryzae* than uninoculated seeds in all the rice varieties tested. The highest seed germination was found in the rice cv. WGL 14 (77.2%) followed by RNR 15048 (75.5 %), Siddhi (74 %) and JGL 11470 (74 %), whereas the lowest seed germination was found in BPT 5204 (64.2 %) followed by JGL 3828 (66.2 %) and RP Bio 226 (67.5 %). Among the seeds collected from Warangal district lowest seed germination was found in WGL 32100 (73.5 %) followed by Siddhi (74 %) over uninoculated seeds (84.7 %, 85.5 %). Among the inoculated seeds of Rangareddy district, lowest seed germination was found in Tellahamsa (70.5 %) followed by Krishna (72 %) over uninoculated seeds (81.7 %, 79.2 %). The rice cv. JGL 3828 showed lowest seed germination (66.2 %) followed by JGL 3855 (68.5%) among the seeds collected from Karimnagar district and among the susceptible checks lowest seed germination was found in BPT 5204 (64.2 %) followed by RP Bio 226 (67.5 %). The reduction in germination may be due to the enzymes and/or toxins produced by the fungus. Similar reduction in germination percentage was reported by Suryanarayana (1978) when inoculated with the fungus *viz.*, *D. oryzae* and *Fusarium* spp. in rice seeds.

Effect of *D. oryzae* on seedling vigour index of popular rice cultivars

The seedling vigour index - I (on seedling length basis) of inoculated seeds was ranged from 635 to 1371. Highest SVI - I was found in the rice variety WGL 14 (1371) followed by RNR 15048 (1160) and JGL 18047 (1053) whereas the lowest SVI - I was found in BPT 5204 (635) followed by RP Bio 226 (713) and JGL 3855 (718). Among the seeds collected from Warangal district, lowest SVI - I was observed in the rice cv. WGL 32100 (962) followed by Siddhi (1028). Rice seeds collected from Rangareddy district, lowest SVI - I was observed in Tellahamsa (823) followed by Krishna (903). Rice cv. JGL 3828 recorded lowest SVI - I (718) followed by JGL 3855 (811) among the seeds collected from Karimnagar district. Among susceptible checks, BPT 5204 (635) followed by RP Bio 226 (713) showed least SVI - I over uninoculated seeds (1236,1369).

The seedling vigour index - II (on dry weight basis) of inoculated seeds ranged from 546 to 1145. The highest SVI -II was found in WGL 14 (1145) followed by RNR 15048 (1113) and JGL 18047 (1005) whereas the lowest SVI - II was found in susceptible checks *viz.*, BPT 5204 (546) followed by RP Bio 226 (641) and MTU 1010 (651). Among the seeds collected from Warangal district, lowest SVI - II was

observed in the rice cv. WGL 32100 (856) followed by Siddhi (968). In the seeds collected from Rangareddy district, lowest SVI –II was observed in Tellahamsa (740) followed by Krishna (810). The rice cv. JGL 3855 recorded lowest SVI –II (735) followed by JGL 11118 (752) over uninoculated seeds (1256, 1316). Similar effects of seed borne fungi on reduction in seedling vigour and seed germination were reported earlier by Islam and Borthakur (2011). High count of seed associated mycoflora results in low per cent germination, higher number of diseased and abnormal seedlings consequently leading to lower vigour index (Haque *et al.* 2007).

Effect of *D. oryzae* on moisture content (%) of popular rice cultivars

There was a significant increase in moisture content in all the rice cultivars when inoculated with *D. oryzae* over uninoculated seeds. The rice cultivars *viz.*, JGL 3828 and BPT 5204 recorded high moisture content (13.5 %) followed by JGL 3855 (12.5 %) whereas low moisture content was found in the cv. sumati (10 %) followed by WGL 14 (10.4%) and RNR 15048 (10.5%). Among the rice seeds collected from Warangal district, high moisture content was observed in WGL 32100 (11.6 %) followed by Siddhi (10.7%). Among the cultivars of Rangareddy district, Tellahamsa (12 %) followed by Krishna (10.7 %) recorded highest increase in moisture content. Among the cultivars of Karimnagar district, JGL 3828 (13.5 %) followed by JGL 3855 (12.5 %) showed highest increase and among checks, BPT 5204 (13.5 %) followed by MTU 1001 (11.5%) and RP Bio 226 (11.5 %) showed highest increase in moisture content over uninoculated seeds (7.65%, 8.52% and 8.57%). Similar findings were reported earlier by Paderes *et al.* (1996) and Saibabu *et al.* (1983).

Table 1: Effect of *D. oryzae* on seed germination, seedling vigour and moisture content of popular rice cultivars

| District | Rice Cultivars | Germination (%) | | SVI - I | | SVI - II | | Moisture content (%) | |
|--------------------|----------------|-----------------|-------------|---------|-------|----------|------|----------------------|------|
| | | IN | UN | IN | UN | IN | UN | IN | UN |
| Warangal | WGL 14 | 77.2 (61.4) * | 88.2 (69.9) | 1371 | 1973 | 1145 | 1831 | 10.4 | 9.12 |
| | WGL 32100 | 73.5 (58.9) | 84.7 (67.0) | 962 | 1665 | 856 | 1483 | 11.6 | 10.0 |
| | Siddhi | 74.0 (59.3) | 85.5 (67.5) | 1028 | 1774 | 968 | 1562 | 10.7 | 8.97 |
| Rangareddy | RNR 15048 | 75.5 (60.3) | 88.5 (70.1) | 1160 | 1969 | 1113 | 1743 | 10.5 | 8.50 |
| | Tellahamsa | 70.5 (57.0) | 81.7 (64.6) | 828 | 1528 | 740 | 1467 | 12.0 | 9.50 |
| | Krishna | 72.0 (58.0) | 79.2 (62.8) | 903 | 1397 | 810 | 1387 | 10.7 | 8.00 |
| | Sumati | 73.0 (58.6) | 83.0 (65.6) | 1005 | 1618 | 949 | 1494 | 10.0 | 7.75 |
| Karimnagar | JGL 18047 | 73.2 (58.8) | 87.0 (68.8) | 1053 | 1868 | 1005 | 1600 | 10.6 | 9.5 |
| | JGL 11470 | 74.0 (59.3) | 84.2 (66.5) | 1015 | 1723 | 903 | 1480 | 11.6 | 8.0 |
| | JGL 3855 | 68.5 (55.8) | 79.5 (63.0) | 811 | 1411 | 735 | 1256 | 12.5 | 7.5 |
| | JGL 3828 | 66.2 (54.4) | 85.5 (67.5) | 718 | 1831 | 896 | 1590 | 13.5 | 9.5 |
| | JGL 11727 | 72.0 (58.0) | 83.5 (66.0) | 896 | 1250 | 851 | 1423 | 11.8 | 7.0 |
| | JGL 17004 | 70.5 (57.0) | 84.0 (66.4) | 950 | 1747 | 884 | 1493 | 11.6 | 8.0 |
| | JGL 11118 | 69.0 (56.1) | 80.0 (63.4) | 864 | 1478 | 752 | 1316 | 12.4 | 8.5 |
| Susceptible checks | BPT 5204 | 64.2 (53.2) | 79.2 (62.8) | 635 | 1236 | 546 | 1149 | 13.5 | 7.65 |
| | MTU 1010 | 68.5 (55.8) | 80.0 (63.4) | 779 | 1410 | 651 | 1140 | 12.0 | 7.70 |
| | MTU 1001 | 71.0 (57.3) | 86.2 (68.2) | 880 | 1688 | 781 | 1365 | 11.5 | 8.52 |
| | RP Bio 226 | 67.5 (55.2) | 81.7 (64.6) | 713 | 1369 | 641 | 1226 | 11.5 | 8.57 |
| SEm± | | 0.38 | 0.42 | 22.1 | 90.2 | 26.1 | 28.4 | 0.31 | 0.29 |
| CD at 5% | | 1.09 | 1.20 | 62.9 | 256.5 | 74.2 | 80.9 | 0.89 | 0.82 |

Each value is a mean of four replications

SVI : Seedling vigour index

IN : Inoculated

*Figures in parenthesis are angular transformed values

UN : uninoculated

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