

Influence on Yield of Different Cultivars of Paddy under Various Cultivation Methods in Relation to Weather Parameters

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Abstract

An experiment entitled, "Studies on effect of different paddy cultivars with various cultivation methods of paddy in relation to weather parameters." was carried out during *kharif*, 2018 at Agricultural Research Station Farm, Vadgaon Maval, Tal. Maval, Dist. Pune. The field experiment was laid out in split plot design with three replications. There were sixteen treatment combinations comprising of four varieties *viz.*, VDN-3-51-18 (*Indrayani*), VDN-99-29 (*PhuleSamruddhi*), IET-13549 (*Bhogawati*) and RDN-99-1 (*Phule Radha*) and four cultivation methods *viz.*, M₁ : Four Point Agro Technique (Char Sutri Method), M₂ : Drilling at 22.5 cm, M₃ : Saguna Rice Technique (SRT) and M₄ : Modified Direct Seeded Rice Technique (MDSRT). The gross plot size was 3.40 m x 3.40 m. From the data it was observed that sowing of paddy varieties with Modified Direct Seeded Rice Technique (MDSRT) favorably influenced all the yield components. This is due to positive correlation with minimum temperature, RH I and RH II. It would be, therefore, suggested to adopt sowing paddy variety Phule Samruddhi or Indrayani with Modified Direct Seeded Rice Technique (MDSRT) to obtain maximum yield.

Key words : Paddy, Cultivation Methods, Cultivar, Yield, Correlation.

Rice (*Oryza sativa* L.) is one of the most ancient crops being cultivated in 117 countries, hence called as "Global Grain In India, it is being cultivated in 44.6million hectare with a production of about 109.5million tonnes. In Maharashtra, rice is the second important crop of the people, which is grown over an area of 14.99 lakh hectares with an annual rough rice production of 32.37 lakh tonnes.

The average productivity of the state is 2.01 t ha⁻¹. Maharashtra ranks 13th place in rice production in country. Large number of paddy varieties have been released for cultivation by private and government sector to enhance its productivity. Hence, it is essential to compare the productivity of these high yielding varieties under agro-climatic condition of rice growing belt of the state. On the other hand, non-availability of irrigation water, insufficient labor

and high wages during the peak period of farm operation invariably delay planting of paddy. To mitigate this problem, many rice farmers are switching to direct seeding of paddy. Direct seeding can reduce the labor requirement, may reduce methane gas emission shorten the duration of crop by 7 to 10 days and provide comparable grain yield to transplanting (De Datta, 1986). Not much information is available on suitable varieties and crop establishment practices for direct seeding in comparison to traditional method. In view of this, present investigation is carried out to study.

Material and Methods

There were sixteen treatment combinations comprising of four varieties *viz.*, VDN-3-51-18 (*Indrayani*), VDN-99-29 (*PhuleSamruddhi*), IET-13549 (*Bhogawati*) and RDN-99-1 (*Phule Radha*) and four cultivation methods *viz.*, M₁ : Four Point Agro Technique (Char Sutri Method),

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M₂ : Drilling at 22.5 cm, M₃ : Saguna Rice Technique (SRT) and M₄ : Modified Direct Seeded Rice Technique (MDSRT). The gross plot size was 3.40 m x 3.40 m. The other details of cultivation methods were as below.

1) Four point agro technique(Char Sutri method) -

1. Use of paddy crop residues containing silicon for recycling (Black grey rice hull ash @ 0.5 to 1.0 Kg per sq.m. to rice seedlings and paddy straw @ 2 tonnes/ha at the time of transplanting.

2. Application of Glyricidea as green manure @ 3 tonnes/ha at the time of transplanting.

3. Controlled transplanting of improved varieties at the spacing of 15-25 x 15-25 cm.

4. Use of Urea DAP briquettes (175 Kg ha⁻¹). N and P through Urea DAP briquettes (60:30:0) + 50 kg K₂O ha⁻¹

2) **Drilling at 22.5 cm** : This method is followed in traditional areas of Western Maharashtra where medium to deep soil are observed. For drilling of rice seed drill is used. Distance between two plants is 22.5 cm. Dose- 100:50:50 kg NPK ha⁻¹

3) **Saguna Rice Technique (SRT)** : Raised beds of 1 m breadth with 8-10 cm height. Rack of 1 m x 1m is placed on bed having iron pegs at 25 cm distance is placed on bed and pressed to make holes. Three seeds per hole are placed and covered carefully. Dose- 100:50:50kg NPK ha⁻¹

4) **Modified Direct Seeded Rice Technique (MDSRT)** : Raised beds of 1m breadth with 8-10cm height were made with the help of rope and wooden rod at a distance of 15-25 x 15-25 cm. Two seeds per hole are dibbled

and covered carefully. Then Urea DAP briquettes placed in the square of 15-15 cm. N and P applied through Urea DAP briquettes (60:30:0) + 50 kg K₂O ha⁻¹

Results and Discussion

Yield studies : The yield of paddy (q ha⁻¹) as influenced by different treatments are presented in Table 1 showed significant difference.

Effect of varieties : The grain and straw yield (q ha⁻¹) of paddy were influenced significantly due to varieties. The grain (59.43 q ha⁻¹) and straw yield (71.25 q ha⁻¹) was

Table 1. Mean grain and straw yield (q ha⁻¹) as influenced by different treatments

| Treatment | Grain yield q ha ⁻¹ | Straw yield q ha ⁻¹ |
|--|--------------------------------|--------------------------------|
| Main plot: Varieties (V) | | |
| V ₁ : VDN-3-51-18 (<i>Indrayani</i>) | 53.23 | 62.63 |
| V ₂ : VDN-99-29 (<i>PhuleSamruddhi</i>) | 59.43 | 71.25 |
| V ₃ : IET-13549 (<i>Bhogawati</i>) | 51.51 | 55.16 |
| V ₄ : RDN-99-1 (<i>PhuleRadha</i>) | 43.64 | 48.28 |
| S.Em± | 1.02 | 1.10 |
| C.D. at 5% | 3.53 | 3.82 |
| Sub plot : Cultivation methods(M) | | |
| M ₁ : Four point agro technique (Char Sutri Method) | 54.73 | 59.33 |
| M ₂ : Drilling at 22.5 cm | 42.32 | 45.86 |
| M ₃ : Saguna Rice Technique (SRT) | 50.71 | 54.94 |
| M ₄ : Modified Direct Seeded Rice Technique (MDSRT) | 60.04 | 65.06 |
| S.Em± | 0.96 | 1.05 |
| C.D. at 5% | 2.82 | 3.05 |
| Interaction between levels of 'V' at same levels of 'M' | | |
| S.Em± | 2.04 | 2.21 |
| C.D. at 5% | 7.07 | 7.64 |
| Interaction between levels of 'M' at same levels of 'V' | | |
| S.Em± | 1.93 | 2.09 |
| C.D. at 5% | 5.63 | 6.10 |
| General mean | 51.95 | 56.30 |

significantly the highest in variety Phule Samruddhi over rest of the paddy varieties. The variety Phule Radha recorded significantly lowest grain (43.64 q ha⁻¹) and straw yield (48.28 q ha⁻¹). The differences in grain yield in paddy varieties might be due to inherent genetically potential of paddy varieties. Similar result was reported by Patak *et al.* (2011) and Joshi *et al.* (2013).

Effect of cultivation methods : The grain and straw yield (q ha⁻¹) of paddy was influenced significantly due to different cultivation methods.

The grain (60.04 q ha⁻¹) and straw yield (65.04 q ha⁻¹) were superior in the treatment of Modified Direct Seeded Rice Technique (MDSRT) than rest of the sowing methods. The lowest grain (42.32 q ha⁻¹) and straw yield (48.28 q ha⁻¹) were produced by the Drilling at 22.5 cm. Similar results were reported by Gunri *et al.* (2004) and Christian (2017).

Effect of interaction : The grain and straw yield (q ha⁻¹) of paddy as influenced by interaction effects between different varieties and cultivation methods are reported in Table 2

Table 2. Grain yield (q ha⁻¹) as influenced by interaction between varieties and cultivation methods at harvest

| Cultivation methods | At harvest | | | | |
|--|----------------|----------------|----------------|----------------|------|
| | M ₁ | M ₂ | M ₃ | M ₄ | Mean |
| Varieties | | | | | |
| V ₁ : VDN-3-51-18 (<i>Indrayani</i>) | 57.5 | 41.5 | 51.8 | 62.1 | 53.2 |
| V ₂ : VDN-99-29 (<i>PhuleSamruddhi</i>) | 64.8 | 48.9 | 56.6 | 67.4 | 59.4 |
| V ₃ : IET-13549 (<i>Bhogawati</i>) | 51.5 | 42.9 | 51.6 | 60.0 | 51.5 |
| V ₄ : RDN-99-1 (<i>PhuleRadha</i>) | 45.1 | 35.9 | 42.8 | 50.7 | 43.6 |
| Mean | 54.7 | 42.3 | 50.7 | 60.0 | |
| S.Em± V at same level of M | 2.04 | | | | |
| C.D. at 5% | 7.07 | | | | |
| S.Em± M at same level of V | 1.93 | | | | |
| C.D. at 5% | 5.63 | | | | |
| General mean | 51.95 | | | | |

Table 3. Straw yield (q ha⁻¹) of paddy as influenced by interaction between varieties and cultivation methods at harvest

| Cultivation methods | At harvest | | | | |
|--|----------------|----------------|----------------|----------------|------|
| | M ₁ | M ₂ | M ₃ | M ₄ | Mean |
| Varieties | | | | | |
| V ₁ : VDN-3-51-18 (<i>Indrayani</i>) | 62.6 | 45.3 | 56.5 | 67.7 | 58.0 |
| V ₂ : VDN-99-29 (<i>PhuleSamruddhi</i>) | 71.2 | 53.8 | 62.3 | 74.1 | 65.4 |
| V ₃ : IET-13549 (<i>Bhogawati</i>) | 55.2 | 45.9 | 55.2 | 64.2 | 55.1 |
| V ₄ : RDN-99-1 (<i>PhuleRadha</i>) | 48.3 | 38.4 | 45.8 | 54.3 | 46.7 |
| Mean | 59.3 | 45.9 | 54.9 | 65.1 | |
| S.Em± V at same level of M | 2.21 | | | | |
| C.D. at 5% | 7.64 | | | | |
| S.Em± M at same level of V | 2.09 | | | | |
| C.D. at 5% | 6.10 | | | | |
| General mean | 56.30 | | | | |

and 3. When paddy variety Phule Samruddhi sown with Modified Direct Seeded Rice Technique (MDSRT) recorded higher grain (67.4 q ha^{-1}) and straw (74.1 q ha^{-1}) yield which were at par with variety *Phule Samruddhi* transplanted by Four Point Agro Technique having grain (64.8 q ha^{-1}) and straw (71.2 q ha^{-1}) yield and variety Indrayani sown by Modified Direct Seeded Rice Technique (MDSRT) having grain (62.1 q ha^{-1}) and straw (67.7 q ha^{-1}) yield. The lowest yields were observed in variety Phule Radha sown by Drill sowing at 22.5 cm having grain (35.9 q ha^{-1}) and straw (38.4 q ha^{-1}) yield.

From Table 4, it was observed that the variety Phule Samruddhi recorded maximum grain yield due to varietal characters and weather conditions during that period. The correlation between weather parameters and grain yield presented in table 4.23 revealed significant positive correlation in case of T min ($r = 0.986^{**}$), RH-I ($r = 0.772^*$) and RH-II ($r = 0.786^*$). Significant negative correlation found with Tmax ($r = -0.673^*$), canopy temperature ($r = -0.873^{**}$) and BSS ($r = -0.443$). Similarly in respect of straw yield it was revealed that the significant negative correlation in case of Tmax ($r = -0.494$), BSS ($r = -0.559$) and canopy temperature ($r = -0.534$). Significant positive correlation found with T min ($r = 0.813^{**}$), RH-I ($r = 0.548$) and RH-II ($r = 0.827^{**}$).

Conclusions

From the data it is observed that sowing of paddy varieties with Modified Direct Seeded Rice Technique (MDSRT) favorably influenced all the yield components. This is due to positive

Table 4. Correlation between weather parameters and yield contributing characters of paddy

| Weather parameter | Grain yield (qha ⁻¹) | Straw yield (q ha ⁻¹) |
|-------------------|----------------------------------|-----------------------------------|
| T max | -0.673* | -0.494 |
| T min | 0.986** | 0.813** |
| R-I | 0.772* | 0.548 |
| R-II | 0.786* | 0.827** |
| Canopy temp. | -0.873** | -0.534 |
| BSS | -0.443 | -0.559 |

* Significant at 5% level, ** Significant at 1% level

correlation with minimum temperature, RH I and RH II. It would be, therefore, suggested to adopt sowing paddy variety Phule Samruddhi or Indrayani with Modified Direct Seeded Rice Technique (MDSRT) to obtain maximum yield.

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