Original Research Article

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Investigation on Ratooning Ability of Redgram (cv. Vamban 2) with Fertilizer Levels under Irrigated Condition

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A B S T R A C T

Field experiments were conducted at National Pulses Research Centre. Vamban to study the ratooning ability of redgram (cv. Vamban 2) with fertilizer levels under irrigated condition. The treatments included population dynamics viz., 60x30cm, 90x30cm, 120x30cm and 150x30cm. Different pruning height at 30, 50, 70cm and cutting only secondary branches and fertilizer levels viz., FRD (25:50:20:20: NPKS/ha), FRD + 25% more of the recommended dose and FRD + 50% more of the recommended dose. The results revealed that adopting a spacing of 120x30 cm recorded the yield of 933 kg/ha followed by 90x30cm, 60x30cm and 150x30cm. Among the pruning height and fertilizer levels, cutting secondary branches only, 50% more of recommended dose of fertilizers found to be superior and recorded an yield of 726 and 933 kg/ha 2015 and 2016 respectively.

Key words
Redgram, Spacing, Pruning height, Fertilizer levels, Rationing.

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Introduction

Redgram is an important pulse crop in our country. This crop is predominantly grown in tropical areas. About 90% of the world production, however, is contributed by India and production changes in this region could have a corresponding effect on the world production. The per capita availability of redgram has shown a decreasing trend in the past several years, with an obvious adverse effect on the nutritional situation in those parts of the developing world where redgram is an integral part of the daily diet. The significance of pulses, in our diet is known, but it has been neglected hither to because of its incidental failure to express its yield potential. The long duration redgram varieties like SA 1 and Vamban 2 and perennial redgram BSR 1 can be raised as inter crop and bund crop to boost productivity (Kannaiyan, 2000) Vamban 2 redgram is a new, long duration and highly resistant to sterility mosaic disease. This variety has a habitat of profuse branching (Muthiah, 2000). Hence fixing optimum plant population will be much useful to the farming community. Under rainfed situation, sterility mosaic disease resistant variety Vamban 2 can be utilised for maximum yield (Asthana and Chaturdevi, 1999). As in addition to that this variety is also performing very well under rationing, capable of yielding upto 60% of the main crop yield. Redgram also improves the physical structure of soil by enhancing water infiltration for subsequent crops and plays
crucial role in sustaining agriculture in rainfed semi-arid farming systems (Arunachalam et al., 1995).

According to Savithri (2000), the analytical data of about 250000 soil samples collected from different states of the country reflected the predominantly of zinc deficiency (48.5%) followed by other.

Materials and Methods

The experiment was conducted at National Pulses Research Centre, Vamban during 2001 to 2003.

The experiment was conducted in split plot design with three replications. In the main plots, population dynamics (60x30cm, 90x30cm, 120x30cm and 150x30cm), pruning height (cutting at 30, 50, 70 cm and cutting secondary branches only) and fertilizer levels in sub plots. (Recommended dose of fertilizers, 25% more of RDF, 50% more of RDF).

The soil was red soil with sandy clay loam texture. The fertility status of the soil was 210, 9.6 and 210 kg of available N, P and K ha$^{-1}$ respectively. The soil pH was 6.3 with the organic carbon content of 0.40 per cent.

The bio-metric observations such as plant height, days to 50% flowering, days to maturity, number of branches, number of pods/plant, number of seeds/pod, pod length and 100 seed weight and grain yield was recorded.

During the first year, this trial was carried out with the treatments i.e. population dynamics and pruning height. During the second year, the experiment was carried with population dynamics best pruning height and fertilizer levels Sowing was taken on 29 06.2001 and 02 07 2002 for 2001 and 2002, respectively.

Results and Discussion

First year (2015)

During the first year there was a rainfall of 994.7 mm received in 52 rainy days. The growth and yield attributes were recorded, statistically analysed and presented in table 1 and 2. The results revealed that plant height and number of secondary branches per plant, did not differ significantly due to treatments. With regard to that of yield attributes viz., number of pods per plant, number of seeds per pod and seed yield, the maximum no of pods / plant was recorded (107) at 60 x 30 cm spacing. It is statistically on par with 120 x 30 cm spacing (101). The number of seeds / pod did not vary much due to varied treatments.

In addition to that days to 50% flowering is more in 150 x 30 cm spacing with a pruning height of 70cm: this is on par with 30 cm, 50 cm followed by cutting secondary branches only. Considering days to maturity of the crop it is early due to adopting a spacing of 150 x 30 cm and pruning height of 50 cm followed by 70 cm and 30 cm. The redgram pod yield (726 kg/ha) was significantly higher with a spacing of 120 x 30 cm followed by 90 x 30 cm (699 kg/ha).

The first year study revealed that adopting a spacing of 120 x 30 cm recorded significantly higher seed yield in long duration redgram (Vamban 2) than normal spacing (90 x 30 cm), closer spacing (60 x 30 cm) and wider spacing (150x30 cm).

Ratooni yield

Based on the recorded yield data, it can be concluded that adoption of 120x30 cm spacing plus pruning secondary branches only gave higher yield (320 kg/ha) followed by 90x30 cm spacing + pruning secondary branches only (290 kg/ha).
Table 1 Effect of spacing and pruning height on growth, yield parameters and yield of Redgram (Vamban 2) -2015

| Treatments | Plant height (cm) | Days to 50% flowering | Days to maturity | No. of secondary branches plant^{-1} | No. of pods plant^{-1} | No. of seeds plant^{-1} | Pod length (cm) | 100 seed weight (g) | seed yield kg ha^{-1} | Ratooning yield (kg/ha) |
|------------|------------------|-----------------------|------------------|--------------------------------------|-----------------------|------------------------|-----------------|---------------------|----------------------|----------------------|
| S₁ C₁      | 313.7            | 141                   | 180              | 24.0                                 | 76.6                  | 3.4                    | 3.5             | 7.2                 | 605                  | 241                  |
| S₁ C₂      | 302.4            | 138                   | 177              | 23.8                                 | 95.2                  | 3.3                    | 3.6             | 7.1                 | 611                  | 252                  |
| S₁ C₃      | 302.8            | 137                   | 175              | 23.0                                 | 97.0                  | 3.4                    | 3.6             | 7.5                 | 601                  | 245                  |
| S₁ C₄      | 313.4            | 139                   | 175              | 24.6                                 | 107.4                 | 3.2                    | 3.5             | 7.2                 | 575                  | 270                  |
| S₂ C₁      | 287.6            | 138                   | 178              | 20.4                                 | 65.8                  | 3.2                    | 3.6             | 7.3                 | 667                  | 228                  |
| S₂ C₂      | 292.5            | 133                   | 174              | 22.2                                 | 76.8                  | 3.3                    | 3.6             | 7.0                 | 678                  | 232                  |
| S₂ C₃      | 293.2            | 131                   | 173              | 21.6                                 | 59.4                  | 3.3                    | 3.4             | 7.4                 | 677                  | 206                  |
| S₂ C₄      | 296.7            | 138                   | 179              | 20.3                                 | 62.6                  | 3.4                    | 3.6             | 7.6                 | 653                  | 290                  |
| S₃ C₁      | 299.9            | 134                   | 174              | 23.6                                 | 100.6                 | 3.3                    | 3.7             | 7.9                 | 726                  | 231                  |
| S₃ C₂      | 291.8            | 132                   | 172              | 24.9                                 | 97.0                  | 3.3                    | 3.6             | 8.0                 | 699                  | 218                  |
| S₃ C₃      | 302.3            | 132                   | 172              | 23.6                                 | 89.2                  | 3.3                    | 3.6             | 8.2                 | 690                  | 221                  |
| S₃ C₄      | 297.2            | 134                   | 174              | 21.6                                 | 89.7                  | 3.4                    | 3.6             | 8.2                 | 681                  | 320                  |
| S₄ C₁      | 292.5            | 141                   | 181              | 23.8                                 | 74.2                  | 3.3                    | 3.6             | 7.2                 | 632                  | 231                  |
| S₄ C₂      | 302.5            | 141                   | 182              | 22.1                                 | 73.6                  | 3.3                    | 3.5             | 7.3                 | 594                  | 235                  |
| S₄ C₃      | 297.8            | 141                   | 181              | 22.2                                 | 80.4                  | 3.3                    | 3.5             | 7.2                 | 610                  | 213                  |
| S₄ C₄      | 313.0            | 138                   | 178              | 23.5                                 | 83.2                  | 3.4                    | 3.5             | 7.9                 | 583                  | 278                  |
| SEd        | 11.8             | 2.7                   | 4.1              | 2.2                                  | 13.5                  | 0.04                   | 0.1             | 0.6                 | 4.6                  | 15.0                 |
| CD (P=0.05)|                 |                       |                  |                                      |                       |                        |                 |                     |                       |                     |
|            | NS               | 5.8                   | 9.6              | NS                                   | 33.0                  | NS                     | NS              | NS                  | NS                   | 11.2                 | 34.0                 |

S₁ = 60 x 30 cm \hspace{1cm} C₁ = Cutting at 30 cm
S₂ = 90 x 30 cm \hspace{1cm} C₂ = Cutting at 50 cm
S₃ = 120 x 30 cm \hspace{1cm} C₃ = Cutting at 70 cm
S₄ = 150 x 30 cm \hspace{1cm} C₄ = Cutting secondary branches only
### Table 2: Effect of spacing and pruning height on growth, yield parameters and yield of Redgram (Vamban 2) -2016

| Treatments | Plant height (cm) | Days to 50% flowering | Days to maturity | No. of secondary branches plant⁻¹ | No. of pods plant⁻¹ | No. of seeds plant⁻¹ | Pod length (cm) | 100 seed weight (g) | seed yield kg ha⁻¹ | Ratooning yield (kg/ha) |
|------------|------------------|-----------------------|-----------------|-----------------------------------|--------------------|----------------------|-----------------|----------------------|------------------|------------------------|
| S₁ F₁      | 259.8            | 34.0                  | 137             | 174                               | 205.5              | 3.7                  | 3.5             | 7.3                  | 698              | 72.3                   |
| S₁ F₂      | 257.0            | 38.0                  | 136             | 177                               | 252.1              | 3.7                  | 3.6             | 7.5                  | 862              | 70.3                   |
| S₁ F₃      | 289.0            | 39.3                  | 135             | 175                               | 265.3              | 4.2                  | 3.6             | 7.6                  | 916              | 81.7                   |
| S₂ F₁      | 235.7            | 35.6                  | 134             | 174                               | 292.7              | 3.5                  | 3.5             | 7.3                  | 740              | 71.6                   |
| S₂ F₂      | 296.3            | 44.0                  | 133             | 177                               | 277.0              | 3.6                  | 3.6             | 7.6                  | 881              | 86.3                   |
| S₂ F₃      | 306.6            | 47.2                  | 134             | 175                               | 319.6              | 3.6                  | 3.6             | 7.8                  | 898              | 86.3                   |
| S₃ F₁      | 272.6            | 45.6                  | 133             | 174                               | 258.8              | 3.7                  | 3.6             | 7.6                  | 867              | 79.0                   |
| S₃ F₂      | 315.8            | 47.8                  | 130             | 175                               | 378.8              | 3.6                  | 3.6             | 8.0                  | 904              | 90.7                   |
| S₃ F₃      | 326.6            | 54.0                  | 135             | 175                               | 399.1              | 3.7                  | 3.7             | 7.8                  | 933              | 94.0                   |
| S₄ F₁      | 282.4            | 40.1                  | 142             | 182                               | 335.1              | 3.7                  | 3.6             | 7.6                  | 681              | 79.0                   |
| S₄ F₂      | 265.5            | 43.5                  | 143             | 183                               | 264.6              | 3.7                  | 3.6             | 8.2                  | 783              | 79.7                   |
| S₄ F₃      | 293.4            | 46.0                  | 146             | 189                               | 273.9              | 3.9                  | 3.6             | 8.2                  | 853              | 85.3                   |
| S Ed       | 13.0             | 3.2                   | 2.7             | 2.6                               | 36.5               | 0.1                  | 0.1             | 0.3                  | 46.2             | 4.9                    |
| CD (P=0.05)| 30.8             | 7.2                   | 5.8             | 5.5                               | 82.9               | 0.3                  | NS              | 0.7                  | 105.2            | 11.0                   |

S₁ = 60 x 30 cm  
S₂ = 90 x 30 cm  
S₃ = 120 x 30 cm  
S₄ = 150 x 30 cm  
F₁ = FRD - 25:50:20 Kg NPKS/ha  
F₂ = FRD + 25% more of the recommended dose  
F₃ = FRD + 25% more of the recommended dose  
C₄ = Cutting secondary braches only  

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Second year (2016)

During the second year trial the same set of spacings were adopted i.e., 60x30cm (S₁), 70x30cm (S₂), 120x30 cm (S₃) and 150x30 cm (S₄). In addition to that, in the sub-plots different levels of fertilizers were tried viz., full recommended dose of fertilizer (FRD — 25.50:20:20 kg NPKS / ha). FRD + 25% more of the recommended dose of fertilizer and FRD + 50% more of the recommended dose of fertilizer. Application of micronutrient (ZnSO₄) @ 25 kg/ha and foliar spray of 2% DAP were common to all the treatment.

Adopting a spacing of 120x30 cm resulted in producing taller plants (326 cm) followed by 90x30cm (306 cm). Shortest plants were recorded at 60x30cm spacing (257cm). As for as the number of secondary branches are concerned, 120x30cm recorded 54 branches whereas 60x30cm recorded a minimum number of branches (34).

The days to 50% flowering and days to maturity were more with a spacing of 150x30 cm +FRD with 50% more of recommended dose of fertilizer. This is on par with FRD +25% more of recommended dose of fertilizer.

Adopting 120x30cm spacing registered more number of pods/plant (394) followed by 150x30cm spacing (335). The lowest number of pods was recorded by the treatment 60x30cm (205).

Adopting a spacing of 60x30cm recorded maximum number of seeds/pod (4.2) whereas 90x30cm spacing gave 3.5 seeds/pod.

Seed yield (933 kg/ha) was maximum with 120x30cm spacing followed by 60x30cm (910 kg/ha). The lowest seed yield (68 kg/ha) was obtained with wider spacing (150x30 cm).

Application of 50 per cent more of recommended level of NPKS recorded better growth parameters viz., plant height, number of secondary branches and yield parameters viz., number of pods/plant and number of seeds/pod. These have been positively correlated with seed yield. A maximum seed yield of 933 kg/ha was recorded due to application of 50 per cent more of recommended dose of fertilizer followed by application of 25 per cent more of recommended dose of fertilizer (904 kg/ha). The lowest yield (681 kg/ha) was recorded by application of recommended dose of fertilizer only.

Adopting 120 x 30 cm spacing plus 50% more of recommended dose of fertilizer recorded superior yield i.e. 933 kg/ha.

Ratoon yield

Visual observations reveal that the growth of ratoon crop was not appreciable. A seed yield of 94 kg/ha was recorded by the treatment 120x30cm spacing plus 50%/a more of recommended dose of fertilizer.

Adopting a spacing of 120x30cm. cutting secondary branches with 50% more of recommended dose of fertilizer (37.5 kg N + 75 kg P; O + 30 kg K.0 + 30 kg S) found to be superior and recorded a seed yield of 726 and 933 kg/ha for 2001 and 2002 respectively. The seed yield recorded due to ratooning was 320 and 94 kg r ha for the year 2001 and 2002 respectively.

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