

Application of P enhanced the net returns in velvet beans in both the seasons (Table 3).

Thus, it can be concluded that for maximum seed yield the recommended spacing is 60 x 20 cm. Application of 50 kg P<sub>2</sub>O<sub>5</sub>/ha significantly increased the yield components and seed yield of all the three crops. Seed production varied with season and in economic terms the best green manure crop was velvet beans among the three tested. Due to its profuse pod bearing habit, high biomass accumulation and other multiple uses its inclusion in the cropping system is highly beneficial.

#### REFERENCES

- AKINOLA, J.O. AND WHITEMAN, P.C. (1975). Agronomic studies on pigeonpea II. Response to sowing density. *Aus. J. Agric. Res.*, 26: 57-66.
- Madras Agric. J., 85(1): 38-40 January 1998  
<https://doi.org/10.29321/MAJ.10.A00684>
- LAWN, R.J. and TROEDSON (1990). Pigeonpea : Physiology of yield formation. In : *The Pigeonpea* (Nene, Y.L., Susan, D.H. and Sheila, V.K. eds.) Cambridge : C.A.B. International, pp. 179-208.
- SIDDIQUE, K.H.M., SEDGLEY, R.H. and MARSHALL, C. (1984). Effect of plant density on growth and harvest index of branches in chickpea. *Fd. Crops Res.*, 9: 193-204.
- SINGH, R.S. (1971). Effect of phosphate and molybdenum on growth, nodulation and seed yield of dhaincha. *Indian. J. Agric. Sci.*, 41: 231-238.
- SINGH, R.S. (1972). Effect of phosphate and boron on growth, nodulation and seed yield of dhaincha. *Indian. J. Agric. Sci.*, 42: 139-144.
- TNAU (1981). Final Report on Scheme for Studies on the Production, Processing and Storage of Seeds of Fodder, Forage and Green Manure Crops. 1979-81. Tamil Nadu Agricultural University, Coimbatore, India.

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## EFFECT OF ORGANIC AND INORGANIC AMENDMENTS ON BHENDI IN LIGNITE MINE SPOIL

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#### ABSTRACT

Reclamation of mine spoil with various types of amendments like coir pith, gypsum, farm yard manure and pressmud and the effect on the performance of bhendi *Abelmoschus esculentus* (L.) Moench) was studied in Neyveli lignite mine spoil. The results indicated that incorporation of 12.5 t/ha each of coir pith and gypsum along with 25 t/ha each of farm yard manure and pressmud resulted in significant increase in the yield of bhendi. A minimum of 12.5 t/ha each of coir pith, gypsum, farm yard manure and pressmud are recommended for any reclamation and revegetation programme.

**KEY WORDS :** Lignite mine spoil, reclamation, amendments, bhendi

In India, about 27,346 ha of mine spoil are available due to 4082 mines (Dadhwal *et al.*, 1988). These are not suitable for cultivation (revegetation) without any amendments due to poor nutrient status, poor texture, structure and absence of adequate density of microflora. The lignite mine spoil at Neyveli is characterised to have massive structure, high bulk density, lower levels of organic carbon, available N and P and requires improvement in physical properties like structure, texture and bulk density (Varadharajan, 1994). Reclamation of lignite mine spoil with various types of amendments like coir pith, gypsum, farmyard manure and pressmud have been

recommended by several workers. However, the combination of amendments and their quantities depend largely on the type and nature of spoil. Further, such reclamation work would be economically viable with those species which are relatively tolerant. Bhendi (*Abelmoschus esculentus* (L.) Moench) has been reported to be tolerant to mine spoil (Senthilkumar, 1995). Hence, an attempt was made to find out the optimum combination of amendments and their effect on bhendi.

#### MATERIALS AND METHODS

The experiment was conducted in the Department of Horticulture, Annamalai University

during 1994-95. The effect of various amendments was studied in factorial randomized design with three replications. The treatments imposed in the present investigation are :

T<sub>1</sub> : Control (Garden soil) ; T<sub>2</sub> : Mine spoil alone ; T<sub>3</sub> : T<sub>2</sub> + 50 g of coir pith (12.5 t/ha) ; T<sub>4</sub> : T<sub>2</sub> + 50 g of gypsum (12.5 t/ha) ; T<sub>5</sub> : T<sub>2</sub> + 50 g of coir pith + 50 g of gypsum + 50 g of farm yard manure (12.5 t/ha) ; T<sub>6</sub> : T<sub>2</sub> + 50 g of coir pith + 50 g of gypsum + 100 g of farm yard manure (25 t/ha) ; T<sub>7</sub> : T<sub>2</sub> + 50 g of coir pith + 50 g of gypsum + 150 g of farm yard manure (37.5 t/ha) ; T<sub>8</sub> : T<sub>2</sub> + 50 g of coir pith + 50 g of gypsum + 50 g of pressmud (12.5 t/ha) ; T<sub>9</sub> : T<sub>2</sub> + 50 g of coir pith + 50 g of gypsum + 100 g of pressmud (25 t/ha) ; T<sub>10</sub> : T<sub>2</sub> + 50 g of coir pith + 50 g of gypsum + 150 g of pressmud (37.5 t/ha) ; T<sub>11</sub> : T<sub>5</sub> + 50 g of pressmud ; T<sub>12</sub> : T<sub>5</sub> + 100 g of pressmud ; T<sub>13</sub> : T<sub>5</sub> + 150 g of pressmud ; T<sub>14</sub> : T<sub>6</sub> + 50 g of pressmud ; T<sub>15</sub> : T<sub>6</sub> + 100 g of pressmud ; T<sub>16</sub> : T<sub>6</sub> + 150 g of pressmud ; T<sub>17</sub> : T<sub>7</sub> + 50 g of pressmud ; T<sub>18</sub> : T<sub>7</sub> + 100 g of pressmud ; and T<sub>19</sub> : T<sub>7</sub> + 150 g of pressmud

Observations were recorded on days to first flowering (DFF), plant height (PH), number of

branches (NB), leaf production (LP), leaf area (LA) dry matter content (DMC) and yield per plant (YP).

## RESULTS AND DISCUSSION

The results (Table 1) indicated that all treatments showed significant results and were better than mine spoil alone (T<sub>2</sub>). However, the highest YP (206.1 g) was exhibited by T<sub>15</sub> (12.5 t/ha each of coir pith and gypsum and 25 t/ha each of farm yard manure and pressmud). However, higher yield than control (T<sub>1</sub>) were observed only in T<sub>15</sub>, T<sub>16</sub>, T<sub>17</sub>, T<sub>18</sub>, T<sub>19</sub> and T<sub>14</sub>. The higher yield observed was mainly due to the influence of amendments on PH, NB, LP, LA, DFF, DMC and YP. and yield per plant.

### Coir pith

Application of coir pith either alone or in combination with other amendments @ 12.5 t/ha had enhanced the performance of bhendi. This might be mainly due to the improvement in the physical properties of mine spoil (Rajesh, 1994) and increased water holding capacity and nutrient supplying ability of coir pith (Ramaswamy and Kothandaraman, 1991).

Table 1. Effect of various amendments on bhendi

T. No.	Plant Height (cm)	Leaf Production (nos)	Leaf area (cm <sup>2</sup> )	No. of branches	Dry matter content (g)	First flowering (days)	Yield / plant (g)
T <sub>1</sub>	53.0	16.5	90.7	4.2	18.0	36.4	158.6
T <sub>2</sub>	32.0	9.8	25.4	2.4	10.2	41.2	54.5
T <sub>3</sub>	38.0	10.3	30.8	2.6	11.2	40.5	60.2
T <sub>4</sub>	41.0	12.4	34.7	2.6	11.8	40.6	63.5
T <sub>5</sub>	43.0	14.1	41.6	3.5	12.1	39.7	93.0
T <sub>6</sub>	47.0	17.3	48.5	3.3	14.5	38.2	106.1
T <sub>7</sub>	42.0	18.2	53.2	4.1	16.3	38.4	128.5
T <sub>8</sub>	45.1	13.4	42.3	3.6	13.2	39.3	89.7
T <sub>9</sub>	50.8	16.6	51.7	4.1	14.5	37.2	102.4
T <sub>10</sub>	47.9	18.2	73.2	4.2	16.1	36.9	120.7
T <sub>11</sub>	48.5	15.7	50.3	3.9	17.6	37.5	114.5
T <sub>12</sub>	51.5	17.2	56.9	3.7	19.8	38.3	131.0
T <sub>13</sub>	53.5	18.3	63.8	4.8	20.1	37.6	144.5
T <sub>14</sub>	51.8	16.1	81.5	4.9	21.2	36.1	158.9
T <sub>15</sub>	58.0	21.5	105.3	5.1	23.0	33.2	206.1
T <sub>16</sub>	57.0	19.8	90.5	4.9	21.6	35.3	180.5
T <sub>17</sub>	55.0	17.3	95.1	3.8	20.1	36.4	159.1
T <sub>18</sub>	54.5	18.4	97.6	3.8	20.7	36.7	162.5
T <sub>19</sub>	56.0	18.7	98.3	3.8	21.5	36.8	165.5
CD (at 5%)	1.4	1.3	2.1	1.2	0.1	0.7	9.8
CD (at 5%)	1.9	1.8	2.8	1.7	0.8	0.9	10.5

Treatment details as in the text

## Gypsum

Incorporation of gypsum either alone or in combination with other amendments had enhanced the performance of bhendi. The applied gypsum might have altered the structure, resulting in increased soil aeration and water infiltration (Ravikumar and Krishnamoorthy, 1980).

## Farm yard manure

The results revealed that the application of farm yard manure recorded increased values of PH, LP, LA, DMC and YP. This may be due to the higher rate of multiplication of soil microbes leading to mobilisation of bound nutrients and improvement in physical properties of soil. It is evident that the performance level in treatments receiving constant doses of 12.5 t/ha each of coir pith and gypsum had increased in proportion to the quantity of farm yard manure.

## Pressmud

The positive response observed for various characters due to incorporation of pressmud could be attributed to the improvement in organic matter content and nutrient status of mine spoil, which would have resulted in desirable physical and chemical properties of the substrate (Rajesh, 1994). This is also evident from the increased performance of bhendi in treatments involving pressmud alone or in combination with other amendments.

## Combination of amendments

The interaction studies revealed that the level of performance varies according to the quantity of farm yard manure and pressmud incorporated at constant doses of gypsum and coir pith (T<sub>11</sub> to T<sub>19</sub>). The increased performance could be mainly due to the improvement of nutritional status of the spoil.

The level of organic (12.5 t/ha) and inorganic amendments (12.5 t/ha) applied at T<sub>11</sub> could be treated as essential to improve the physical properties and to bring it to the level of control (T<sub>1</sub>). The treatments in T<sub>14</sub>, T<sub>15</sub>, T<sub>16</sub>, T<sub>17</sub>, T<sub>18</sub>, T<sub>18</sub> and T<sub>19</sub> which showed higher performance than control (T<sub>1</sub>) might have resulted from the improvement of both physical and chemical properties. The additional benefits of pressmud and farm yard manure applied above 12.5 t/ha could be obtained by substituting these with inorganic fertilizers, as the effects were mainly due to improvements in nutritional status (Arasu and Kuppaswamy, 1995).

## REFERENCES

- ARASU, R and KUPPUSWAMY, G. (1995). Effect of organic and inorganic amendments for the growth and yield of groundnut in open cast mine spoil. *Annamalai Uni. Res. Ann.*, 20: 25-30.
- DADHWAL, K.S., BIJENDRA SINGH, P. NARAIN and KAITYAR, V.S. (1988). Techniques for the rehabilitation of degraded mined lands. *Indian Soil conser.*, 18 : 51-62.
- RAJESH, T. (1994). Reclamation and Reclamation and Revegetation of Open Cast Mine Spoil With Ornamental Annuals. M.Sc., (Ag.) Thesis. Annamalai Univ., Tamil Nadu.
- RAMASWAMY, P.P. and KOTHANDARAMAN, G.V. (1991). Drought management using agro-industrial wastes. In: *Seminar on Utilization of Coir Pith in Agriculture*. TNAU, Coimbatore. pp. 83-91.
- RAVIKUMAR, V. and KRISHNAMOORTHY, K.K. (1980). Influence of soil amendments on the physical properties of black soil. *Madras Agric. J.*, 67 : 177-182.
- SENTHILKUMAR, R. (1995). Reclamation and Revegetation of Open Cast Mine Spoil with Vegetable Crops. M.Sc., (Ag.) Thesis. Annamalai Univ., Tamil Nadu.
- VARADHARAJAN, P. (1994). Studies on the Role of Biofertilizers and Organic Amendments in the Enrichment of Mine Spoil for Better Establishment of Tree Species. M.Sc., (Ag.) Thesis. Annamalai University, Tamil Nadu.

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