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# Performance of Niger (*Guizotia abyssinica* Cass.) Sown in different Meteorological Weeks with Various Establishment Techniques Under *Konkan* Condition

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## ABSTRACT

**The experiment was conducted on lateritic soils of konkan on hill plot of the Agronomy farm, College of Agriculture, Dapoli, Dist. Ratnagiri during *kharif*, 2013, to study the effect of sowing time and sowing method on growth and yield of Niger (*Guizotia abyssinica* Cass.) under *konkan* condition. The present investigation was carried out in a strip plot design with three replications. The main plot treatments comprised of four sowing times *viz.*, 7th June (23rd MW), 21st June (25th MW), 5th July (27th MW) and 22nd July (29th MW) and sub-plot treatments constituted three methods of sowing *Viz.*, Broadcasting, drilling at 30 cm and Dibbling at 30 x 10 cm. Thus, there were in all twelve treatment combinations. The gross plot size was 4.2 m x 3.2 m and net plot size was 3.6 m x 3.0 m, respectively. Significantly increased the growth parameters of niger sown in 25th MW such as plant height, number of green leaves plant$^{-1}$, dry matter accumulation sq m$^{-1}$ over sowing of niger in 23rd MW, 27th MW and 29th MW. Sowing of niger in 25th MW produced maximum and significantly higher seed yield and stalk yield over rest of the sowing times. Dibbling recorded significantly higher values of all the yield attributing characters *viz.*, number of capitula sq m$^{-1}$, weight of capitula (g) sq m$^{-1}$, number of seeds capitulum$^{-1}$ over broadcasting but at par with drilling. However, drilling remained at par with dibbling in case of seed yield (g) sq m$^{-1}$ but, recorded significantly higher stalk yield (g) sq m$^{-1}$, and total dry matter (g) sq m$^{-1}$ over broadcasting and dibbling.**

**Key word** *Sowing time, sowing method, growth and yield*

Niger (*Guizotia abyssinica* Cass.) is an important traditional oilseed crop cultivated mainly in Ethiopia and India. Niger seeds contain around 40 per cent oil and about 20 per cent protein. Niger seed oil contains linoleic acid as the primary fatty acid (75-80%), followed by palmitic and stearic acids (7-8%) and oleic acid (5-8%), although Indian Niger oil is reported higher in oleic acid (25%) and lower in linoleic acid (55%). Described as having a "nutty taste and a pleasant odour," the edible oil is the main product from Niger seed in both Ethiopia and India. (Burnette, 2010). India is considered to the major niger producing country in the World with an area of 3.64 lakh hectares with the production of 0.98 lakh tonnes and average seed yields is 269 kg ha$^{-1}$ when grown in pure stands (Anonymous, 2011). The major niger growing states are, Madhya Pradesh, Orissa, Maharashtra, Karnataka, Bihar, Andhra Pradesh and West Bengal.

In Maharashtra, niger is grown over an area of 0.37 lakh hectares with annual production of 0.12 lakh tonnes and the seed yield 324 kg ha$^{-1}$. (Anonymous, 2011). The major niger growing districts in Maharashtra are Nashik, Osmanabad, Latur, Nanded, Beed, Kolhapur, Pune, Dhule, Ratnagiri and Thane. The choice of sowing dates were identified as important management options to optimise yield of crop. In *Konkan* region of Maharashtra with high rainfall and undulating topography, it is cultivated on very light soils on hill slopes where other crops cannot be grown successfully. Thus, it is a most neglected crop raised under very poor management. Neither it is manured nor the farmers care to sow a high yielding variety. Besides, the cost of cultivation of this crop is also very low. The farmer in *Konkan* region cultivated niger on sub-marginal lands without any manuring or fertilization. Similarly, no attention is paid to sow it timely to provide suitable growing environment for higher yield. These lands are often subjected to heavy erosion resulting in continuous reduction in soil fertility status and subsequent reduction in yield of Niger. Often, the seed being light in weight and therefore it washed away due to rainwater causes reduction in plant population and yield of the crop.

## MATERIAL AND METHODS

The field investigation was carried out during *kharif*, 2013 at Agronomy farm, College of Agriculture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri district of Maharashtra. The soil of experimental plot was sandy clay loam in texture, low in available nitrogen (265.18 kg ha$^{-1}$) and phosphorus (11.25 kg ha$^{-1}$), moderately high in available potassium (245.63 kg ha$^{-1}$), very high in organic carbon (0.97 %) and slightly acidic in nature (pH 5.64). The present investigation was carried out in a strip plot design. The main plot treatments comprised of four sowing times (23rd MW, 25th MW, 27th MW and 29th MW) and sub-plot treatments constituted three methods of sowing (Broadcasting, Drilling with 30cm and Dibbling with 30cm x 10cm). Thus, there were in all twelve (12) treatment combinations with replicated thricely. The gross plot size was 4.2 m x 3.2 m and net plot size was 3.6 m x 3.0 m, respectively. Seed bed for the experimental crop was prepared by ploughing the land with tractor drawn plough, followed by one operation by tractor drawn rotavator for clod crushing.

The seeds were sown in four different sowing times *viz*., 7th June (23rd MW), 21st June (25th MW), 5th July (27th MW) and 22nd July (29th MW) with broadcast method, drilling (Row spacing 30 cm) and dibbling (30 cm x 10 cm) by using the seed rate 8 kg ha$^{-1}$, 6 kg ha$^{-1}$ and 4 kg ha$^{-1}$, respectively, with the help of manual labour and covered

**Table 1. Growth attributes of niger influenced by different treatments**

| Treatments | Plant population (sq $m^{-1}$) | Plant height (cm) | Number of leaves $plant^{-1}$ | Number of branches (sq $m^{-1}$) | Dry matter accumulation (sq $m^{-1}$) |
|---|---|---|---|---|---|
| **Sowing time** | | | | | |
| $T_1$- 23 MW | 62.59 | 159.27 | 16.30 | 530.40 | 1156.37 |
| $T_2$- 25 MW | 63.31 | 170.48 | 19.43 | 572.81 | 1251.00 |
| $T_3$- 27 MW | 61.96 | 155.72 | 14.34 | 499.04 | 1064.09 |
| $T_4$- 29 MW | 58.97 | 147.63 | 13.51 | 460.99 | 943.27 |
| S.E. ± | 2.07 | 1.69 | 0.63 | 9.01 | 26.90 |
| C.D. 5% | N.S. | 5.21 | 1.94 | 27.78 | 82.90 |
| **Methods of sowing** | | | | | |
| $M_1$- Broadcasting | 66.13 | 163.16 | 14.60 | 436.99 | 972.99 |
| $M_2$- Drilling | 61.05 | 159.30 | 16.95 | 522.13 | 1041.59 |
| $M_3$- Dibbling | 57.94 | 152.37 | 16.14 | 588.31 | 1296.47 |
| S.E. ± | 1.06 | 1.99 | 0.32 | 8.15 | 28.80 |
| C.D. at 5% | 3.26 | 6.14 | 0.99 | 25.10 | 88.75 |
| **Interaction effect** | | | | | |
| S.E. ± | 2.35 | 7.72 | 1.34 | 27.54 | 60.14 |
| C.D. at 5% | N.S. | N.S. | N.S. | N.S. | N.S. |

properly with soil. One hand weeding was carried out at 30 DAS to keep the crop free from weed competition for growth resources. In order to avoid water stagnation in the field, the channels were prepared to drained out excess water.

The experimental crop was harvested when the seeds in the capitulum matured and turned black in colour. Only the net plots were harvested after removing guard lines and observation plants (5 plants/ plot). The harvesting was carried out manually with the help of sickles.

The harvested material was kept in the field for two days for sun drying. Later it was threshed manually by beating the harvested material with wooden sticks and seeds were separated. The threshed product was winnowed and cleaned immediately and then the grain and stalk weights were recorded.

**Table 2. Yield and yield attributes of niger influenced by different treatments.**

| Treatments | No. of capitula sq. $m^{-1}$ | No. of seeds $capitulum^{-1}$ | 1000-seed weight (g) | Seed yield (g) sq. $m^{-1}$ | Seed yield (q $ha^{-1}$) | Stalk yield (q $ha^{-1}$) | Total dry matter (q $ha^{-1}$) |
|---|---|---|---|---|---|---|---|
| **Sowing time** | | | | | | | |
| $T_1$- 23$^{rd}$ MW | 1810.52 | 22.49 | 3.51 | 24.31 | 2.43 | 13.22 | 15.64 |
| $T_2$- 25$^{th}$ MW | 1966.27 | 23.47 | 3.56 | 28.84 | 2.88 | 15.24 | 18.12 |
| $T_3$- 27$^{th}$ MW | 1649.27 | 21.09 | 3.34 | 22.73 | 2.27 | 12.71 | 14.98 |
| $T_4$- 29$^{th}$ MW | 1580.76 | 20.71 | 3.25 | 19.45 | 1.95 | 11.58 | 13.52 |
| S.E. ± | 37.33 | 0.33 | 0.07 | 0.76 | 0.08 | 0.36 | 3.94 |
| C.D. 5% | 115.03 | 1.01 | N.S. | 2.35 | 0.24 | 1.12 | 12.15 |
| **Methods of sowing** | | | | | | | |
| $M_1$-Broadcasting | 1432.92 | 185.69 | 18.68 | 3.35 | 19.63 | 111.07 | 13.07 |
| $M_2$- Drilling | 1865.28 | 212.23 | 22.78 | 3.48 | 27.19 | 150.37 | 17.77 |
| $M_3$- Dibbling | 1956.91 | 223.57 | 24.35 | 3.41 | 24.69 | 134.17 | 15.86 |
| S.E. ± | 36.21 | 5.41 | 0.49 | 0.04 | 0.89 | 2.43 | 3.03 |
| C.D. at 5% | 111.59 | 16.67 | 1.52 | N.S. | 2.74 | 7.50 | 9.34 |
| **Interaction effect** | | | | | | | |
| S.E. ± | 132.42 | 18.45 | 1.33 | 0.15 | 3.80 | 13.77 | 15.14 |
| C.D. at 5% | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. |

## RESULTS AND DISCUSSION

### Growth attributes

Data from Table 1 revealed that the parameter like plant population sq $m^{-1}$ was not influenced significantly due to different sowing time. Sowing time 25th MW significantly increased the growth parameters of niger such as plant height (170.48 cm), number of green leaves $plant^{-1}$ (19.43), number of branches sq $m^{-1}$ (572.81), dry matter accumulation sq $m^{-1}$ (1251 g) than sowing of niger in 23rd MW, 27th MW and 29th MW. Such kinds of results were earlier observed by Mohan Kumar *et al.* (2011) in Raichur and Priya *et al.* (2007) in Dharwad.

Broadcasting shows significantly greater plant height over dibbling and at par with drilling at all the crop growth stages and at harvest. The growth characters viz., number of branches sq m-1, and dry matter production sq $m^{-1}$ of niger were significantly enhanced in dibbling as compared to broadcasting and drilling at all the crop growth stages. The test weight of niger was not influenced significantly due to different establishment methods. Among different methods of sowing drilling recorded significantly higher seed yield and stalk yield $ha^{-1}$ over broadcasting and dibbling. The increased in seed yield recorded by drilling over broadcasting and dibbling was 39.7 and 12.2 per cent, respectively. The increased in stalk yield recorded by drilling over broadcasting and dibbling was 35.3 and 12.0 per cent, respectively.

The reason of high dry matter accumulation sq $m^{-1}$ when niger was grown in 25th MW may be traced to the significant increased in morphological parameters such as plant height, number of leaves and number of branches sq $m^{-1}$ due to conducive climatic conditions to niger crop throughout the growth period compared to other sowing dates which are responsible for the photosynthetic activity of the plant thereby increasing the biological yield. Due to increase in photosynthates source i.e. growth attribute, effect on sink. Interaction effect was non significant.

### Yield attributes and yield

The result from Table 2 revealed that, sowing of niger in 25th MW significantly improved the yield attributes except weight of capitula sq $m^{-1}$ and thousand seed weight which was not significantly influenced by different sowing time. Sowing of niger in 25th MW (18 June – 24 June) recorded maximum and significantly higher seed yield (2.88 q $ha^{-1}$) and stalk yield (15.64 q $ha^{-1}$) as well as yield attributes such as number of capitula sq $m^{-1}$ (1966.27), number of seeds per capitulum (23.47), seed yield sq $m^{-1}$ (28.84 g) and total dry matter sq $m^{-1}$ (181.29 g) over 23rd MW, 27th MW and 29th MW. These results are in agreement with the results reported by Mohan Kumar *et al*. (2011) and Priya *et al.* (2007) in niger, respectively. This may due to the increased plant height, number of leaves $plant^{-1}$, number of branches sq $m^{-1}$ and dry matter production sq $m^{-1}$ *i.e.* more is source and ultimately more food material produced which was diverted toward the sink *i.e.* yield attributing characters and reflect on yield observed in 25th MW.

Dibbling recorded significantly higher values of all the yield attributing characters viz., number of capitula sq $m^{-1}$, weight of capitula (g) sq $m^{-1}$, number of seeds $capitulum^{-1}$ over broadcasting but at par with drilling. However, drilling remained at par with dibbling in case of seed yield (g) sq $m^{-1}$ but, recorded significantly higher stalk yield (g) sq $m^{-1}$, and total dry matter (g) sq $m^{-1}$ over broadcasting and dibbling. The favourable influence of drilling on increasing the yield contributory characters almost near to the dibbling or sink characters provided evidence for provided greater seed yield over broadcasting and dibbling. The efficient utilization of light, moisture and improved uptake of nutrients also supports the yield improvement of niger under drilling. Interaction effect were found non significant.

## CONCLUSION

On the basis of results obtained by experimental study, it can be concluded that, in *Konkan* region, niger should be sown in 25th meteorological week with drilling method (Line sowing at 30 cm) for obtaining higher yield.

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