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# Effect of INM on yield and cost of cultivation coconut

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**Abstract**
The coconut (Cocos nucifera L.) palm eulogized as "Kalpavriksha" and "Tree of Heaven", it provides not only edible parts but also fuel, shelter, medicine and employment to the millions of people in tropics. The experiment was laid out in Randomized Block Design comprising ten treatments replicated thrice. The treatments were applied in three splits (viz., Stage I- June, Stage II- October and Stage III- February) in a year. The yield of the each palm was recorded throughout the year under experimental plot. The year wise yield was worked out and analyzed statistically.
The application of RDF + Azadirachtin + Micronutrients through briquettes (Treatment T5) receiving highest yield along with maximum net return and B:C ratio. Therefore, it is concluded that the application of RDF along with Azadirachtin and Micronutrients through Konkan Annapurna Briquettes in three splits (i.e. June, October and February) is beneficial for increasing the yield of coconut with maximum profit.

**Keywords:** INM, Coconut, Yield, Cost of cultivation and Maharashtra

## Introduction
Coconut is the most popular palm grown in about 90 countries of the world occupying about 10 million hectares of land and producing nearly 42 billion nuts per year (Sivanesan and Prabin, 2013) [3]. India, which was the leading producer in coconut production, has lost its place to Indonesia and Phillipines according to recent finding (Shashikumar and Chandrashekar, 2014) [2]. The area under coconut in Ratnagiri district (M.S.) is 4,549 hectares with an annual production of 409.41 lakh nuts and average productivity of 9,001 nuts $ha^{-1}$ (Anonymous, 2015) [1]. The coconut palm requires balanced fertilization of NPK; the response of N and K was common while response of P was under certain conditions. Palms with larger yield potential need higher dose of NPK. Worldwide people realized that pure chemical farming undermines the natural mechanism operating in the ecosystem and often leads to soil degradation, pollution of ground water and eutrophication of water bodies with nitrates, phosphates and pesticides (Upadhyay *et al.*, 1998) [8]. Organic manures are important in sustaining soil productivity especially for a perennial crop like coconut, which requires continuous supply of nutrients.
It has therefore, integrated nutrient management been always considered for best fertilization of crops. Therefore, considering all these facts, present study was undertaken.

## Materials and Methods
A field experiment was conducted during 2014-15 and 2015-16 in a thirty years old coconut garden of cultivar Pratap at the farm of Asond block, Central Experiment Station, Wakawali, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Tal.- Dapoli, Dist.- Ratnagiri (M.S.) which is located at $17.68^0$ N latitude and $73.28^0$ E longitudes with an altitude of 250 m MSL. The research station receives very high annual average rainfall of 3500 mm in rainy days. The soils of experimental site are well drained, sandy clay loam in texture, slightly acidic in reaction with low electrical conductivity and high in organic carbon content. The soil is medium in available nitrogen, low in available phosphorus and high in available potassium content. Kaolinite is the dominant clay mineral in this soil.
The experiment was laid out in Randomized Block Design comprising ten treatments (*viz.*, $T_1$- Absolute Control (No manure, no fertilizer), $T_2$- Recommended Dose of Fertilizers (RDF) only, $T_3$- Application of RDF through briquettes, $T_4$- Application of RDF + Azadirachtin

through briquettes, $T_5$- Application of RDF + Azadirachtin + Micronutrients through briquettes, $T_6$- Application of RDF + Neem oil through briquettes, $T_7$- Application of RDF through briquettes and neem cake at 15 kg/palm, $T_8$- Application of RDF + Root feeding with Azadirachtin 5 % @ 7.5 mL + 7.5 mL water, $T_9$- Application of RDF + Drenching with Eriophyid smash 250 mL/ 20 L of water and $T_{10}$- RDN through FYM at 25 kg/palm/year + Neem cake at 15 kg/palm/year + Vermicompost at 6 kg/palm/year) replicated thrice. Two palms for each treatment were selected at Farm of Asond Block, C.E.S. Wakavali, Dr. B. S. Konkan Krishi Vidyapeeth, Dapoli, Dist- Ratnagiri during 2014-15 and 2015-16. The treatments were applied in three splits (*viz*., Stage I- June, Stage II- October and Stage III- February) in a year. The yield of the each palm was recorded throughout the year under experimental plot. The year wise yield was worked out and analyzed statistically. The yield data was processed statistically for Randomized Block Design by following the standard procedures given by Panse and Sukhatme (1967) [4].

## Results and Discussion

### (a) Effect on Yield

The data given in Table 1, clearly explain that the yield of coconut significantly increased due to application of manures and fertilizers in both the years of trial i.e. 2014-15 and 2015-16. The application of RDF + Azadirachtin + Micronutrient through briquettes ($T_5$) recorded significantly higher nut yield (125.33 and 129.50 nuts palm$^{-1}$ year$^{-1}$) over rest of the treatments during both years of experimentation, respectively except treatments $T_8$ and $T_9$. Treatment $T_5$ was at par with treatments $T_8$ and $T_9$. The lowest yield was recorded by the treatment $T_1$ (Absolute control).

An overall the nut yield of coconut during first year and second year ranged between 85.33 to 125.33 nuts palm$^{-1}$ year$^{-1}$ and 84.67 to 129.50 nuts palm$^{-1}$ year$^{-1}$, respectively. In comparison of both years an increasing trend of nut yield from first year to second year was noticed due to application of manures and fertilizers. The increase in nut yield during second year might be due to combined effect of manures and fertilizers applied during second year as well as the residual impact of manures and fertilizers applied during first year.

In general, due to application of manure and fertilizers through different treatments the nut yield in coconut orchard was found to be increased over absolute control during both years of the experiment. The increase in nut yield with integration of organics with fertilizers was attributed to increased female flowers and nut setting per cent due to improved availability of nutrients to coconut.

The beneficial response of manures and fertilizers over absolute control to yield might be attributed to the availability of sufficient amount of plant nutrients throughout the year to the crop, improvement of soil environment resulting in higher root proliferation leading to better absorption of moisture and nutrients, plant vigour and ultimately higher yield. After proper decomposition and mineralization, the manures supplied available nutrients directly to the plants and also had solubilising effect on fixed forms of nutrients in soil (Sinha *et al.*, 1981) [5].

Similar results of higher nut yield with integrated use of manures and fertilizers also reported by Temgire (2007) [7] and Talashilkar *et al*. (2008) [6].

**Table 1:** Effect of integrated use of manures and fertilizers on yield (nuts palm$^{-1}$ year$^{-1}$) of coconut

| Treat. No. | Treatments | 2014-15 | 2015-16 |
|---|---|---|---|
| $T_1$ | Absolute Control (No manure, no fertilizer) | 85.33 | 84.67 |
| $T_2$ | Recommended Dose of Fertilizers (RDF) only | 98.67 | 104.50 |
| $T_3$ | Application of RDF through briquettes | 102.17 | 114.17 |
| $T_4$ | Application of RDF + Azadirachtin through briquettes | 112.50 | 117.67 |
| $T_5$ | Application of RDF + Azadirachtin + Micronutrient (B) through briquettes | 125.33 | 129.50 |
| $T_6$ | Application of RDF + Neem oil through briquettes | 103.33 | 113.00 |
| $T_7$ | Application of RDF through briquettes and neem cake at 15 kg/palm | 114.83 | 116.67 |
| $T_8$ | Application of RDF + Root feeding with Azadirachtin 5 % @ 7.5 mL + 7.5 mL water | 122.67 | 126.17 |
| $T_9$ | Application of RDF + Drenching with Eriophyid smash 250 mL/ 20 L of water | 123.83 | 127.17 |
| $T_{10}$ | RDN through FYM at 25 kg/palm/year + Neem cake at 15 kg/palm/year + Vermicompost at 6 kg/palm/year | 104.00 | 101.17 |
| | SE $\pm$ | 3.43 | 3.31 |
| | CD @ 5 % | 10.19 | 9.84 |

### (b) Effect on economics of coconut cultivation

The perusal data presented in **Table 2** indicate the economics of coconut cultivation due to application of different treatment in both the years i.e. 2014-15 and 2015-16. The application of RDF + azadirachtin + micronutrients through briquettes ($T_5$) recorded highest B:C ratio and net return during both the years of experiment.

During first year, a scrutiny of the data indicated that the treatment $T_5$ (Application of RDF + azadirachtin + micronutrients through briquettes) recorded highest in B: C ratio (2.29) followed by treatment $T_8$ (2.25), $T_4$ (2.24), $T_3$ (2.19), $T_6$ (2.15), $T_9$ (2.07), $T_1$ (2.07), $T_2$ (2.00), $T_7$ (1.44) and $T_{10}$ (1.18). The treatment $T_{10}$ receiving application of RDN through FYM at 25 kg/palm /year + Neem cake at 15 kg/palm/year + Vermicompost at 6 kg/palm/year recorded lowest B: C ratio in first year. The maximum net return was highest in treatment $T_5$ receiving application of RDF + azadirachtin + micronutrients through briquettes (Rs. 2,07,241) followed by treatment $T_8$ receiving application of RDF + Azadiractin + Micronutrient through briquettes (Rs. 2,00,212) during first year. The lowest net return (Rs. 47,262) was recorded by treatment $T_{10}$ (RDN through FYM at 25 kg/palm/year + Neem cake at 15 kg/palm/year +Vermicompost at 6 kg/palm/year) during first year.

In the second year the data showed that treatment $T_5$ (application of RDF + azadirachtin + micronutrients through briquettes) recorded highest B: C ratio (2.33) followed by treatment $T_4$ (2.30), $T_8$ (2.29), $T_6$ (2.27), $T_3$ (2.25), $T_9$ (2.10), $T_2$ (2.08), $T_1$ (2.06), $T_7$ (1.46) and $T_{10}$ (1.16). Treatment $T_{10}$ receiving application of RDN through FYM at 25 kg/palm/year + Neem cake at 15 kg/palm/year + Vermicompost at 6 kg/palm/year recorded lowest B: C ratio in the second year. The maximum net return was obtained in treatment $T_5$ receiving application of RDF + Azadiractin + Micronutrient through briquettes (Rs. 2,17,444) followed by treatment $T_8$ receiving application of RDF + Root feeding

with azadirachtin 5 % @ 7.5 ml + 7.5 ml water (Rs. 2,08,778) during second year. The lowest net return (Rs. 40,332) was recorded by treatment $T_{10}$ (RDN through FYM at 25 kg/palm/year + Neem cake at 15 kg/palm/year +Vermicompost at 6 kg/palm/year) during second year.

The B:C ratio obtained in $T_7$ (1.44 and 1.46) and $T_{10}$ (1.18 and 1.16) were lower than the absolute control during first year and second year, respectively. The cost of inputs *viz*., neem cake, vermicompost and FYM required in bulk quantity were the contributing factors for higher cost of cultivation under treatment $T_7$ (Application of RDF through briquettes and neem cake at 15 kg/palm) and $T_{10}$ (RDN through FYM at 25 kg/palm/year + Neem cake at 15 kg/palm/year + Vermicompost at 6 kg/palm/year), which eventually reduce the net return and B:C ratio of these treatments.

The root feeding with azadirachtin requires skilled person for its application and it is quite difficult for uneducated farmers to practice such operations in field. The wages of skilled labours are higher than the unskilled labour that increase the cost of production. The drenching of eriophyid smash and root feeding with azadirachtin are the separate operations which also increasing the cost of production. However, instead of root feeding and drenching of eriophyid smash, if the azadirachtin and micronutrients are supplied through briquettes mixing with inorganic fertilizers it will be beneficial as well as become simple for its application in coconut orchard even at unskilled farmer level.

**Table 2:** Effect of integrated use of manures and fertilizers on economics of coconut cultivation

| Treat. No. | Yield (Nuts ha$^{-1}$) | | Gross Return (Rs. ha$^{-1}$) | | Cost of Cultivation (Rs. ha$^{-1}$) | | Net Return (Rs. ha$^{-1}$) | | Cost benefit ratio (B:C ratio) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2014-15 | 2015-16 | 2014-15 | 2015-16 | 2014-15 | 2015-16 | 2014-15 | 2015-16 | 2014-15 | 2015-16 |
| $T_1$ | 15189 | 15071 | 250619 | 248672 | 121311 | 120987 | 129307 | 127685 | 2.07 | 2.06 |
| $T_2$ | 17563 | 18601 | 289790 | 306917 | 144676 | 147530 | 145114 | 159386 | 2.00 | 2.08 |
| $T_3$ | 18186 | 20322 | 300069 | 335313 | 136884 | 142758 | 163185 | 192555 | 2.19 | 2.25 |
| $T_4$ | 20025 | 20945 | 330413 | 345593 | 147792 | 150322 | 182620 | 195270 | 2.24 | 2.30 |
| $T_5$ | 22309 | 23051 | 368099 | 380342 | 160857 | 162898 | 207241 | 217444 | 2.29 | 2.33 |
| $T_6$ | 18393 | 20114 | 303485 | 331881 | 141269 | 146002 | 162216 | 185879 | 2.15 | 2.27 |
| $T_7$ | 20440 | 20767 | 337260 | 342656 | 233649 | 234548 | 103611 | 108108 | 1.44 | 1.46 |
| $T_8$ | 21835 | 22458 | 360278 | 370557 | 160066 | 161779 | 200212 | 208778 | 2.25 | 2.29 |
| $T_9$ | 22042 | 22636 | 363693 | 373494 | 176073 | 177706 | 187620 | 195788 | 2.07 | 2.10 |
| $T_{10}$ | 18512 | 18008 | 305448 | 297132 | 258186 | 256800 | 47262 | 40332 | 1.18 | 1.16 |

**Cost of Manures/ Fertilizers/ Chemicals:**

| | | | |
|---|---|---|---|
| Urea | = Rs.7 kg$^{-1}$ | Neem cake | = Rs. 32 kg$^{-1}$ |
| Single Super Phosphate | = Rs. 9 kg$^{-1}$ | Borax | = Rs. 340 kg$^{-1}$ |
| Muriate of Potash | = Rs. 24 kg$^{-1}$ | Ammonium molybdate | = Rs. 12 g$^{-1}$ |
| Fertilizers Briquettes | = Rs. 26 kg$^{-1}$ | Eriopyied smash | = Rs. 400 L$^{-1}$ |
| FYM | = Rs. 5 kg$^{-1}$ | Neem oil | = Rs. 600 L$^{-1}$ |
| Vermicompost | = Rs. 12 kg$^{-1}$ | Azadirachtin | = Rs. 900 L$^{-1}$ |

**Labour Charges:**

| | |
|---|---|
| Un-skilled Male | = Rs. 192 day$^{-1}$ |
| Skilled labour | = Rs. 266 day$^{-1}$ |

## Conclusion

The application of RDF + Azadirachtin + Micronutrients through briquettes (Treatment $T_5$) receiving highest yield along with maximum net return and B:C ratio. Therefore, it is concluded that the application of RDF along with Azadirachtin and Micronutrients through Konkan Annapurna Briquettes in three splits (i.e. June, October and February) is beneficial for increasing the yield of coconut with maximum profit.

## Reference


1. Anonymous www.coconutboard.gov.in/presentation/ statistics/ statistics.aspx, 2015.
2. Shashikumar S, Chandrashekar HM. An analysis of production and marketing of coconut in Tumkur district of India. International Journal of Current Research and Academic Review. 2014; 2(10):167-175.
3. Sivanesan R, Prabin S. Problems and prospects of coconut industries in Kanyakumari district of Tamil Nadu., International Journal of Management. 2013; 4(6):135-144.
4. Panse VG, Sukhatme PV. Statistical methods for Agril. Workers, L.C.A.R., New Delhi, 1967.
5. Sinha NP, Prasad B, Ghosh AB. Effect of continuous use of fertilizers on yield and nutrient uptake in wheat-soybean-potato cropping system. Journal of the Indian Society of Soil Science. 1981; 29:537-542.
6. Talashilkar SC, Nagwekar DD, Akhave SR, Dabke DJ. Effect of integrated use of manures and fertilizers on coconut yield and changes in available nutrient content and N, P and K fractions of *Inceptisols* of Konkan region, Journal of Plantation Crops. 2008; 36(2):112-116.
7. Temgire AM. Effect of integrated use of manures and fertilizers on yield, nutrient uptake and quality of coconut (*Cocos nucifera* Li.) and soil properties, M.Sc. (Agri.) Thesis submitted to Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri, Maharashtra, 2007.
8. Upadhyay AK, Srinivasa Reddy DV, Biddappa CC. Organic farming technology for coconut, Indian Coconut Journal. 1998; 24:74-78.