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# Effect of Banana Pseudostem Scutching Waste, FYM and Biocompost on Nutrient Content and Uptake by Cabbage

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## ABSTRACT

**A field experiment was conducted at N.A.U, Navsari, Gujarat to study the effect of different organic manures on nutrient content and uptake by cabbage. The experiment comprised of nine treatment of banana pseudostem scutching waste (SW), FYM and biocompost (BC) with or without combination and applied as FYM @ 10 t ha$^{-1}$ carbon equivalent basis with the common dose of recommended fertilizer. The finding showed that application of 100% FYM ($O_0$) gave significantly higher value of primary nutrients (N, P and K), secondary nutrients (Ca, Mg and S) and micronutrients (Fe, Mn, Zn and Cu) content and uptake by cabbage. In addition, the second and third highest content and uptake of macro and micronutrients were found in treatment $O_2$ (100% BC) and $O_6$ (75% FYM + 25% SW), respectively.**

**Key words** *banana pseudostem scutching waste, biocompost, carbon equivalent, nutrient content, uptake and FYM*

Cabbage is a cole crop and one of the important fresh and processing vegetable crop in most countries of the world. In India, it is mainly cultivated in Gujarat, Uttar Pradesh, Orissa, Bihar, West Bengal, Assam, Maharashtra and Karnataka. The area under this crop grown in India is 4.01 lakh ha with annual production of 91 lakh tonnes (Anon., 2015).

Chemical fertilizers and organic manures play a pivotal role in vegetable production. Organic manures including the key characteristics and economically viable way of supplying nutrients to crops. Integrated application of diverse source of nutrients not only increase the uptake of plant nutrients but also improve the post harvest soil fertility and subsequently helps for achieving much desired crop production with sustainable soil health (Chatterjee and Bandyopadhyay, 2014).

Presently, the banana pseudostem (60 to 80 t ha$^{-1}$) is absolute waste in most of the banana growing states of India. Disposal of pseudostem in a routine ways *i.e.,* dumping on field bunds and burning, disposing in nalla/ natural drains *etc*. causing environmental problems (Anon., 2014). In past, some researchers have successfully demonstrated use of banana pseudostem for extraction of fibers on a small scale. Use of banana pseudostem scutching waste (30-35 t ha $^{1}$) as an organic for crop production at large scale can solve the problem of disposal of wastes and lack of organic matter in soil. On the other hand, a judicious combination of different organic and inorganic sources of nutrients might be helpful to obtain higher nutrient content and uptake by crop and a good soil health for the subsequent crops.

## MATERIALS AND METHODS

Field experiment was conducted during the *rabi* season of 2015-16 at Soil and Water Management Farm of Navsari Agricultural University, Navsari, Gujarat. The soil of experimental field was clay in texture had following characteristics: $pH_{2.5}$ 8.3, $EC_{2.5}$ of 0.4 ds m$^{-1}$ and organic carbon 0.62%. The experiment soil was low in available nitrogen (246 kg ha$^{-1}$) and sulphur (6 mg kg$^{-1}$), medium in available phosphorus (45 kg ha$^{-1}$) and manganese (8 mg kg$^{-1}$) and high in available potassium (410 kg ha$^{-1}$), iron (14 mg kg$^{-1}$), zinc (1.2 mg kg$^{-1}$) and copper (3 mg kg$^{-1}$). The experiment comprised of nine treatments of FYM, biocompost (BC) and banana pseudostem scutching waste (SW) and it's combinations *viz*., 100% FYM ($O_0$), 100% SW ($O_1$), 100% BC ($O_2$), 75% BC + 25% SW ($O_3$), 50% BC + 50% SW ($O_4$), 25% BC + 75% SW ($O_5$), 75% FYM + 25% SW ($O_6$), 50% FYM + 50% SW ($O_7$) and 25% FYM + 75% SW ($O_8$) were applied as basal on 10 t ha$^{-1}$ FYM carbon equivalent basis with common dose of recommended fertilizer (100:50:50 N, $P_2O_5$, $K_2O$ kg ha$^{-1}$).

Treatments were evaluated in randomized block design with three replications on cabbage variety "*Golden Acre"*. In the experiment fresh banana pseudostem scutching waste was used which consist of pithy matter and cut fibers generated during fiber extraction from banana pseudostem. Chemical compositions of organic manures used in the experiment are given in Table 1. The nutrient concentration in plant samples were determined by methods given in Table 2. Nutrient uptake by cabbage was worked out by computing the values of content and dry matter production. Data pertaining to nutrient content and uptake by crop were statistically analyzed as per the methods described by Panse and Sukhatme (1967).

### Nutrient content

**Primary nutrient**: Application of 100% FYM recorded significantly higher value of N, P and K content in both head as well as leaves (Table 3). The N content in head and leaves recorded were 2.48 and 2.66 per cent, respectively and was found to be statistically at par with treatments $O_2$,

**Table 1. Composition of organics manures used in the experiment**

| Parameters | FYM | Biocompost | Scutching waste |
|---|---|---|---|
| OC (%) | 21.55 | 25.05 | 34.45 |
| N (%) | 1.20 | 1.15 | 0.90 |
| $P_2O_5$ (%) | 0.40 | 0.35 | 0.20 |
| $K_2O$ (%) | 0.50 | 0.45 | 0.59 |
| Fe (mg $kg^{-1}$) | 3592 | 7706 | 1228 |
| Mn (mg $kg^{-1}$) | 531 | 470 | 60 |
| Zn (mg $kg^{-1}$) | 150 | 182 | 6 |
| Cu (mg $kg^{-1}$) | 49 | 89 | 8 |
| C:N ratio | 18 | 22 | 38 |

**Table 2. Methods for analysis of nutrients in plant**

| Nutrient analyzed | Method followed | Reference |
|---|---|---|
| N | Kjeldahl | Jackson, 1973 |
| P | Vanadomolybdo phosphoric acid yellow colour | Jackson, 1973 |
| K | Flame photometric | Jackson, 1973 |
| Ca and Mg | Complexometric | Jackson, 1973 |
| S | Turbidmetric | Chaudhary and Cornfield, 1966 |
| Fe, Mn, Zn and Cu | Atomic Absorption Spectrophotometric | Elwell and Gridley, 1967 |

**Table 3. Effect of organic manures on primary nutrient content (%) in head and leaves of cabbage**

| Treatments | Head | | | Leaves | | |
|---|---|---|---|---|---|---|
| | N | P | K | N | P | K |
| $O_0$ : 100% FYM | 2.48 | 1.12 | 2.05 | 2.66 | 0.98 | 2.22 |
| $O_1$ : 100% SW | 2.12 | 0.72 | 1.79 | 2.35 | 0.71 | 1.84 |
| $O_2$ : 100% BC | 2.45 | 1.10 | 1.95 | 2.62 | 0.94 | 2.17 |
| $O_3$ : 75% BC + 25% SW | 2.42 | 0.95 | 1.93 | 2.49 | 0.85 | 2.09 |
| $O_4$ : 50% BC + 50% SW | 2.40 | 0.88 | 1.83 | 2.55 | 0.83 | 2.00 |
| $O_5$ : 25% BC + 75% SW | 2.30 | 0.82 | 1.81 | 2.45 | 0.76 | 1.86 |
| $O_6$ : 75% FYM + 25% SW | 2.46 | 1.06 | 1.98 | 2.56 | 0.91 | 2.17 |
| $O_7$ : 50% FYM + 50% SW | 2.43 | 0.91 | 1.93 | 2.52 | 0.84 | 2.02 |
| $O_8$ : 25% FYM + 75% SW | 2.29 | 0.86 | 1.84 | 2.45 | 0.78 | 1.95 |
| SEm± | 0.061 | 0.026 | 0.048 | 0.058 | 0.028 | 0.052 |
| CD at 5% | 0.18 | 0.08 | 0.14 | 0.18 | 0.08 | 0.16 |
| CV% | 4.49 | 4.81 | 4.37 | 4.02 | 5.77 | 4.42 |

**Table 4. Effect of organic manures on secondary nutrient content (%) in head and leaves of cabbage**

| Treatments | Head | | | Leaves | | |
|---|---|---|---|---|---|---|
| | Ca | Mg | S | Ca | Mg | S |
| $O_0$ : 100% FYM | 0.62 | 0.26 | 0.37 | 1.08 | 0.50 | 0.41 |
| $O_1$ : 100% SW | 0.31 | 0.12 | 0.21 | 0.96 | 0.35 | 0.23 |
| $O_2$ : 100% BC | 0.58 | 0.25 | 0.36 | 1.08 | 0.47 | 0.38 |
| $O_3$ : 75% BC + 25% SW | 0.47 | 0.22 | 0.31 | 1.00 | 0.46 | 0.33 |
| $O_4$ : 50% BC + 50% SW | 0.46 | 0.19 | 0.30 | 0.99 | 0.42 | 0.30 |
| $O_5$ : 25% BC + 75% SW | 0.32 | 0.14 | 0.22 | 0.97 | 0.38 | 0.24 |
| $O_6$ : 75% FYM + 25% SW | 0.58 | 0.25 | 0.36 | 1.08 | 0.48 | 0.36 |
| $O_7$ : 50% FYM + 50% SW | 0.43 | 0.21 | 0.32 | 1.00 | 0.45 | 0.31 |
| $O_8$ : 25% FYM + 75% SW | 0.33 | 0.16 | 0.22 | 0.97 | 0.38 | 0.24 |
| SEm± | 0.016 | 0.006 | 0.009 | 0.035 | 0.015 | 0.011 |
| CD at 5% | 0.05 | 0.02 | 0.03 | NS | 0.04 | 0.03 |
| CV % | 6.06 | 5.39 | 5.13 | 5.90 | 5.94 | 5.86 |

**Table 5. Effect of organic manures on micronutrient content (mg kg$^{-1}$) in head and leaves of cabbage**

| Treatments | Head | | | | Leaves | | | |
|---|---|---|---|---|---|---|---|---|
| | Fe | Mn | Zn | Cu | Fe | Mn | Zn | Cu |
| $O_0$ : 100% FYM | 189.7 | 75.4 | 58.0 | 17.0 | 205.8 | 87.7 | 62.0 | 18.3 |
| $O_1$ : 100% SW | 162.5 | 62.2 | 45.7 | 14.7 | 152.0 | 66.0 | 51.8 | 16.4 |
| $O_2$ : 100% BC | 185.1 | 71.6 | 53.7 | 16.8 | 202.9 | 83.5 | 60.7 | 18.0 |
| $O_3$ : 75% BC + 25% SW | 179.0 | 67.7 | 50.0 | 16.2 | 196.6 | 75.8 | 56.5 | 17.7 |
| $O_4$ : 50% BC + 50% SW | 171.3 | 67.4 | 49.3 | 16.0 | 193.0 | 72.9 | 55.3 | 17.6 |
| $O_5$ : 25% BC + 75% SW | 166.7 | 65.5 | 45.7 | 15.2 | 172.4 | 69.7 | 53.3 | 16.9 |
| $O_6$ : 75% FYM + 25% SW | 181.3 | 71.1 | 54.3 | 16.6 | 200.3 | 81.5 | 58.9 | 17.9 |
| $O_7$ : 50% FYM + 50% SW | 178.0 | 67.4 | 48.4 | 15.2 | 191.5 | 78.2 | 54.2 | 17.4 |
| $O_8$ : 25% FYM + 75% SW | 166.3 | 66.1 | 46.5 | 15.1 | 171.0 | 66.7 | 53.0 | 17.1 |
| SEm± | 4.4 | 3.0 | 1.7 | 0.4 | 5.0 | 2.5 | 1.7 | 0.4 |
| CD at 5% | 13.1 | NS | 5.0 | 1.3 | 15.1 | 7.6 | 5.0 | NS |
| CV % | 4.3 | 7.6 | 5.8 | 4.8 | 4.7 | 5.8 | 5.2 | 4.0 |

**Table 6. Effect of organic manures on primary nutrient uptake (kg ha$^{-1}$) by head and leaves of cabbage**

| Treatments | Head | | | Leaves | | |
|---|---|---|---|---|---|---|
| | N | P | K | N | P | K |
| $O_0$ : 100% FYM | 62.71 | 28.36 | 51.99 | 71.55 | 26.27 | 59.61 |
| $O_1$ : 100% SW | 36.36 | 12.33 | 30.69 | 44.42 | 13.39 | 34.78 |
| $O_2$ : 100% BC | 55.30 | 24.80 | 43.94 | 68.39 | 24.62 | 56.66 |
| $O_3$ : 75% BC + 25% SW | 48.68 | 19.13 | 38.77 | 55.75 | 19.01 | 46.78 |
| $O_4$ : 50% BC + 50% SW | 45.22 | 16.62 | 34.54 | 54.90 | 17.82 | 43.06 |
| $O_5$ : 25% BC + 75% SW | 43.01 | 15.32 | 33.86 | 48.93 | 15.24 | 37.13 |
| $O_6$ : 75% FYM + 25% SW | 54.64 | 23.63 | 44.05 | 63.28 | 22.55 | 53.71 |
| $O_7$ : 50% FYM + 50% SW | 45.96 | 17.24 | 36.49 | 53.32 | 17.78 | 42.61 |
| $O_8$ : 25% FYM + 75% SW | 41.63 | 15.65 | 33.39 | 48.91 | 15.66 | 38.91 |
| SEm± | 1.304 | 0.524 | 0.956 | 1.317 | 0.666 | 1.129 |
| CD at 5% | 3.91 | 1.57 | 2.87 | 3.95 | 2.00 | 3.39 |
| CV% | 4.69 | 4.72 | 4.29 | 4.03 | 6.03 | 4.26 |

**Table 7. Effect of organic manures on secondary nutrient uptake (kg ha$^{-1}$) by head and leaves of cabbage**

| Treatments | Head | | | Leaves | | |
|---|---|---|---|---|---|---|
| | Ca | Mg | S | Ca | Mg | S |
| $O_0$ : 100% FYM | 15.78 | 6.58 | 9.37 | 29.11 | 13.54 | 11.08 |
| $O_1$ : 100% SW | 5.33 | 2.12 | 3.54 | 18.05 | 6.68 | 4.28 |
| $O_2$ : 100% BC | 13.09 | 5.57 | 8.07 | 28.11 | 12.14 | 9.99 |
| $O_3$ : 75% BC + 25% SW | 9.50 | 4.35 | 6.29 | 22.51 | 10.34 | 7.32 |
| $O_4$ : 50% BC + 50% SW | 8.73 | 3.58 | 5.71 | 21.42 | 9.02 | 6.40 |
| $O_5$ : 25% BC + 75% SW | 5.98 | 2.65 | 4.10 | 19.31 | 7.56 | 4.81 |
| $O_6$ : 75% FYM + 25% SW | 12.81 | 5.55 | 7.92 | 26.66 | 11.80 | 8.99 |
| $O_7$ : 50% FYM + 50% SW | 8.14 | 3.98 | 6.00 | 21.04 | 9.41 | 6.48 |
| $O_8$ : 25% FYM + 75% SW | 6.00 | 2.91 | 4.06 | 19.37 | 7.69 | 4.74 |
| SEm± | 0.320 | 0.125 | 0.175 | 0.728 | 0.372 | 0.228 |
| CD at 5% | 0.96 | 0.37 | 0.52 | 2.18 | 1.11 | 0.68 |
| CV% | 5.85 | 5.23 | 4.96 | 5.52 | 6.57 | 5.55 |

**Table 8. Effect of organic manures on micronutrient uptake (g ha$^{-1}$) by head and leaves of cabbage**

| Treatments | Head | | | | Leaves | | | |
|---|---|---|---|---|---|---|---|---|
| | Fe | Mn | Zn | Cu | Fe | Mn | Zn | Cu |
| $O_0$ : 100% FYM | 470.4 | 190.8 | 146.9 | 43.0 | 553.5 | 236.0 | 166.7 | 49.3 |
| $O_1$ : 100% SW | 280.6 | 106.8 | 78.5 | 25.3 | 287.3 | 124.7 | 97.9 | 30.9 |
| $O_2$ : 100% BC | 420.6 | 161.5 | 121.1 | 37.9 | 529.0 | 217.6 | 158.2 | 47.0 |
| $O_3$ : 75% BC + 25% SW | 354.3 | 135.9 | 100.5 | 32.6 | 440.8 | 169.9 | 126.7 | 39.6 |
| $O_4$ : 50% BC + 50% SW | 331.6 | 126.9 | 92.8 | 30.1 | 415.4 | 157.0 | 119.1 | 37.8 |
| $O_5$ : 25% BC + 75% SW | 315.4 | 122.5 | 85.5 | 28.4 | 344.8 | 139.5 | 106.6 | 33.9 |
| $O_6$ : 75% FYM + 25% SW | 409.6 | 157.8 | 120.7 | 36.9 | 495.8 | 201.8 | 145.8 | 44.3 |
| $O_7$ : 50% FYM + 50% SW | 333.3 | 127.6 | 91.7 | 28.8 | 404.6 | 165.2 | 114.5 | 36.7 |
| $O_8$ : 25% FYM + 75% SW | 315.1 | 120.1 | 84.5 | 27.5 | 341.8 | 133.4 | 106.0 | 34.2 |
| SEm± | 8.0 | 6.7 | 3.6 | 0.9 | 11.2 | 5.4 | 3.8 | 0.9 |
| CD at 5% | 24.1 | 20.2 | 10.7 | 2.8 | 33.6 | 16.1 | 11.3 | 2.8 |
| CV % | 3.9 | 8.4 | 6.0 | 4.9 | 4.6 | 5.4 | 5.2 | 4.1 |

$O_3$, $O_4$, $O_6$ and $O_7$ in case head and $O_2$, $O_3$, $O_6$ and $O_7$ for leaves. For P the content in head it was 1.12 per cent, while for leaves it was 0.98 per cent. However, these values were found to be at par with treatments $O_2$, $O_6$ for both head and leaves. In case of K content in head it was 2.05 and statistically at par with treatments $O_2$, $O_3$, $O_6$ and $O_7$. For leaves the content was 2.22 per cent and was at par with $O_2$, $O_3$, and $O_6$ treatments.

**Secondary nutrient:** Application of different organic manures showed a significant effect on secondary nutrient (Ca, Mg and S) content in head and leaves of cabbage except Ca content in leaves (Table 4). Application of 100% FYM gave significantly higher values of Ca (0.62% in head), Mg (0.26% in head and 0.50% in leaves) and S (0.37% in head and 0.41% in leaves) content and remained at par with the treatments $O_2$ and $O_6$ in case of Ca for head, in case of Mg $O_2$ and $O_6$ for head and $O_2$, $O_3$ and $O_6$ for leaves and in case of S $O_2$, and $O_6$ for head and $O_2$ for leaves.

**Micronutrients:** Application of different organic manures registered a significant effect on micronutrient (Fe, Mn, Zn and Cu) content in head and leaves of cabbage except Mn content in head and Cu content in leaves (Table 5). Application of 100% FYM gave significantly higher value of Fe (189.7 mg kg$^{-1}$ in head and 205.8 mg kg$^{-1}$ in leaves), Mn

**Table 9. Effect of organic manures on total macronutrient (kg ha$^{-1}$) and micronutrient (g ha$^{-1}$) uptake by cabbage (head + leaves)**

| Treatments | N | P | K | Ca | Mg | S | Fe | Mn | Zn | Cu |
|---|---|---|---|---|---|---|---|---|---|---|
| $O_0$ : 100% FYM | 134.26 | 54.63 | 111.60 | 44.90 | 20.12 | 20.45 | 1023.86 | 426.83 | 313.56 | 92.31 |
| $O_1$ : 100% SW | 80.78 | 25.71 | 65.47 | 23.38 | 8.80 | 7.82 | 567.89 | 231.54 | 176.41 | 56.24 |
| $O_2$ : 100% BC | 123.69 | 49.43 | 100.60 | 41.20 | 17.70 | 18.06 | 949.61 | 379.12 | 279.28 | 84.90 |
| $O_3$ : 75% BC + 25% SW | 104.44 | 38.14 | 85.56 | 32.01 | 14.69 | 13.62 | 795.09 | 305.89 | 227.18 | 72.22 |
| $O_4$ : 50% BC + 50% SW | 100.12 | 34.43 | 77.60 | 30.15 | 12.60 | 12.12 | 747.02 | 283.94 | 211.86 | 67.90 |
| $O_5$ : 25% BC + 75% SW | 91.94 | 30.56 | 71.00 | 25.30 | 10.20 | 8.91 | 660.24 | 261.95 | 192.09 | 62.23 |
| $O_6$ : 75% FYM + 25% SW | 117.91 | 46.18 | 97.76 | 39.47 | 17.34 | 16.91 | 905.43 | 359.60 | 266.50 | 81.22 |
| $O_7$ : 50% FYM + 50% SW | 99.28 | 35.02 | 79.10 | 29.19 | 13.39 | 12.48 | 737.98 | 292.86 | 206.19 | 65.50 |
| $O_8$ : 25% FYM + 75% SW | 90.54 | 31.31 | 72.30 | 25.36 | 10.59 | 8.80 | 656.87 | 253.51 | 190.48 | 61.63 |
| SEm± | 1.845 | 0.802 | 1.828 | 0.743 | 0.367 | 0.316 | 11.063 | 9.378 | 5.528 | 1.312 |
| CD at 5% | 5.53 | 2.41 | 5.48 | 2.23 | 1.10 | 0.95 | 33.17 | 28.12 | 16.57 | 3.93 |
| CV % | 3.05 | 3.62 | 3.75 | 3.98 | 4.56 | 4.13 | 2.45 | 5.23 | 4.18 | 3.17 |

(87.7 mg kg$^{-1}$ in leaves), Zn (58.0 mg kg$^{-1}$ in head and 62.0 mg kg$^{-1}$ in leaves) and Cu (17.0 mg kg$^{-1}$ in head) content and remained at par with the treatments $O_2$, $O_3$, $O_6$ and $O_7$ in case of Fe for head and $O_2$, $O_3$, $O_4$, $O_6$ and $O_7$ for leaves, in case of Mn $O_2$ and $O_6$ for leaves, in case of Zn $O_2$, and $O_6$ for both head and leaves and in case of Cu $O_2$, $O_3$, $O_4$ and $O_6$ for head.

The increase in nutrient content might be due to addition of low C:N ratio containing organic manure enhanced early mineralization thus increasing the availability of macro and micronutrients and minimizing the fixation of nutrients. This also helped in steady supply of balanced nutrient throughout the growth period due to improvement in soil fertility status. Similar results were also reported by Zahradnik and Petrikova, 2007, Escobar and Hue, 2010, Brito *et al.*, 2013 in cabbage and Chatterjee and Bandyopadhyay, 2014 in tomato.

**Nutrient uptake**

**Primary nutrient:** Application of different organic manures registered a significant effect on primary nutrient (N, P and K) uptake by head and leaves of cabbage. Application of 100% FYM recorded significantly higher value of N (62.71 kg ha$^{-1}$ in head and 71.55 kg ha$^{-1}$ in leaves), P (28.36 kg ha$^{-1}$ in head and 26.27 kg ha$^{-1}$ in leaves) and K (51.99 kg ha$^{-1}$ in head and 59.61 kg ha$^{-1}$ in leaves) uptake and was at par with the treatments $O_2$ in case of N, P and K uptake by leaves (Table 6).

**Secondary nutrient:** Application of 100% FYM gave significantly higher value of Ca (15.78 kg ha$^{-1}$ in head and 29.11 kg ha$^{-1}$ in leaves), Mg (6.58 kg ha$^{-1}$ in head and 13.54 kg ha$^{-1}$ in leaves) and S (9.37 kg ha$^{-1}$ in head and 11.08 kg ha$^{-1}$ in leaves) uptake (Table 7).

**Micronutrient:** Application of 100% FYM gave significantly higher uptake of Fe (470.4 g ha$^{-1}$ in head and 553.5 g ha$^{-1}$ in leaves), Mn (190.8 g ha$^{-1}$ in head and 236.0 g ha$^{-1}$ in leaves), Zn (146.9 g ha$^{-1}$ in head and 166.7 g ha$^{-1}$ in leaves) and Cu (43.0 ha$^{-1}$ in head and 49.3 g ha$^{-1}$ in leaves) and remained at par with the treatment $O_2$ in case of Fe, Zn and Cu for leaves only (Table 8).

**Total nutrient (Head + Leaves):** Application of 100% FYM ($O_0$) gave significantly higher total uptake of N (134.26 kg ha$^{-1}$), P (54.63 kg ha$^{-1}$), K (111.60 kg ha$^{-1}$) Ca (44.90 kg ha$^{-1}$), Mg (20.12 kg ha$^{-1}$) and S (20.45 kg ha$^{-1}$). In addition, the second and third highest total uptake of macronutrients were found in treatment $O_2$ (100% BC) and $O_6$ (75% FYM + 25% SW), respectively. Likewise macronutrients, total uptake of micronutrients were significantly affected by different organic manures. The results indicated that among the all treatments, application of 100% FYM noted highest total uptake of Fe (1023.86 g ha$^{-1}$), Mn (426.83 g ha$^{-1}$), Zn (313.56 g ha$^{-1}$) and Cu (92.31 g ha$^{-1}$). Supplementary, second and third highest total uptake were noted in treatments $O_2$ and $O_6$, respectively (Table 9).

Application of low C:N ratio containing organic manures significantly increased plant growth and yield attributes, yield and dry matter accumulation, ultimate resulted into the high uptake of macro and micronutrients. It might be due to application of organic sources which enhances the biological activity in soil ultimately resulting in increased availability of macro and micro nutrients in soil significantly, consequently improving the uptake of nutrients. Almost similar results were also reported by Kanwer and Paliyal, 2005, Sur and Das, 2006, Mathakiya and Meisheri, 2007, Singh and Pandey, 2010 and Brito *et al.*, 2013 in cabbage and Chander and Verma, 2009 in cauliflower.

**CONCLUSION**

On the basis of result obtained in present field investigation, it is concluded that application of 100% FYM

or 100% BC or 75% FYM + 25% banana psedostem scutching waste along with 100% recommended dose of fertilizers (100:50:50 N, $P_2O_5$, $K_2O$ kg $ha^{-1}$) enhanced the nutrient content and uptake by cabbage.

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