

EFFECT OF INTEGEATED NUTRIENT MANAGEMENT ON SOIL ORGANIC CARBON OF SUMMER GREEN GRAM (*Vigna radiata* L.) – KHARIF FINGER MILLET (*Eleusine coracana* L.) CROPPING SEQUENCE UNDER SOUTH GUJARAT CONDITION

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ABSTRACT:

A field experiment was conducted at the College Farm, Navsari Agricultural University, Navsari during the year 2019 and 2020. The soil of the experimental field was clayey in texture, low in organic carbon (0.40 %) and available nitrogen (213.42 kg/ha), medium in available phosphorus (37.55 kg/ha) and high in available potassium (318.27 kg/ha). The soil was slightly alkaline in reaction (pH-7.96). The treatment consisted of integrated nutrient management viz., T1 - Absolute control, T2 - 100% RDF (20-40-00 NPK kg/ha), T3 – 100% RDF + bio-compost @ 2.5 t/ha, T4 – 100% RDF + bio-compost @ 2.5 t/ha + PSB (soil application @ 2.5 l/ha), T5 – 50 % RDF + bio-compost @ 2.5 t/ha, T6 – 50% RDF + bio-compost @ 2.5 t/ha + PSB (soil application @ 2.5 l/ha) to green gram in summer season as main plot treatment, replicated four times in randomized block design. During kharif season each main plot treatment was splited into three sub plot treatments with three levels of recommended dose of fertilizer viz., F1 – 100 % RDF + crop residue incorporation (40-20-00 NPK kg/ha), F2 - 75% RDF + crop residue incorporation, F3 - 50% RDF + crop residue incorporation in finger millet resulting in eighteen treatment combinations replicated four times in split plot design. Higher soil organic carbon recorded in treatment combination T4F1 as summer green gram crop should be nourished with 100% RDF + bio-compost @ 2.5 t/ha + PSB (soil application @ 2.5 l/ha) (RDF: 20-40-00 N-P2O5-K2O kg/ha) and kharif finger millet crop should be fertilized with 100% RDF + crop residue incorporation (40-20-00 N-P2O5-K2O kg/ha) in green gram – finger millet sequence under south Gujarat condition. Soil organic carbon in T4F1 is around 0.538 % in the year of 2019 that amount of organic carbon is increased as value 0.544% in the year of 2020 cropping sequence of summer green gram – kharif finger millet under south Gujarat condition.

KAYWORDS: Green gram, finger millet, cropping sequence, bio-compost, integrated nutrient management, growth, yield

INTRODUCTION:

Green gram is an important pulse crop of India as it is the third rank among pulse crops. It is grown on an area of 3.44 million ha with total production of 1.4 million tonnes and productivity of 407 kg/ha (Anon., 2017a). In Gujarat, it is cultivated in about 2.3 lakh hectares with an annual production of 1.21 lakh tonnes and average productivity of 526 kg/ha (Anon., 2017b). Green gram (*Vigna radiata* L.) is an important pulse crop having high nutritive value. It not only plays an important role in human diet but also in improving the soil fertility by fixing the atmospheric nitrogen. Due to short duration nature, it is an excellent crop to fit in intercropping system with different major crops. It is also grown as a green manure crop. Being a close growing and spreading crop, it helps in reducing soil erosion and also checks weed growth. Being a legume, it adds nitrogen in the soil. Also, there is a possibility to intensify the system through introduction of green gram as a catch crop during summer, which is helpful in improving soil nutrient status (Venkatesh et al., 2015).

Green gram is also known as mung, moong, mungo, golden gram, Chickasaw pea and Oregon pea. It contains about 25 per cent protein, 1.3 per cent fat, 3.5 per cent minerals, 4.1 per cent fiber and 56.7 per cent carbohydrate. The protein content of green gram is two to three times more than that of cereals. It is consumed as a whole grain as well as dal in a variety of way in homes; being easily digestible it is preferred by patients. It is valued for its excellent taste, flavour, and high digestibility and free from the “flatulency effect” which is associated with other pulses. When moong beans are allowed to sprout ascorbic acid (Vitamin C) is synthesized besides riboflavin and thiamine is also increased.

Among the major food grains, finger millet is one of the most nutritious crops for protein, minerals (calcium and iron) and provides 8-10 times more calcium than wheat or rice (Anon., 2014). Finger millet having the unique property of slower digestibility thereby it is a very good food crop for pregnant women and person who suffering from diabetes. Watt and Breyer-Brandwijk (1962) reported that finger millet has been used to remedy several diseases.

Finger millet [*Eleusine coracana* (L.) Gaertn.] is the third most important millet in India, next to sorghum and pearl millet, grown over an area of 1.13 million hectares with an annual production of 1.98 million tonnes and a productivity of 1661 kg/ha. In Andhra Pradesh, it is cultivated in an area of 44,000 hectares with a production of 36,000 tonnes having productivity of 1045 kg/ha (Ministry of Agriculture and Cooperation, 2016). Finger millet is an important small millet crop grown in India and has the pride of place in having highest productivity

among millets. It is also known as ragi, African millet and Bird's foot millet and an important staple food crop in part of eastern and central Africa and India. In fact, it is the main cereal crop of monsoon season in some hilly areas, where it is grown both for grain and fodder purpose. In India, it is cultivated in Karnataka, Tamil Nadu, Andhra Pradesh, Orissa, Jharkhand, Uttaranchal, Maharashtra, and Gujarat.

Legume – Cereal rotation have been recognized for restoring soil fertility and increasing crop production. Nutrient management in the sequential cropping is important to reduce fertilizer cost. Application of chemical fertilizer can boost crop yields but it impairs soil physico-chemical properties. Therefore, an integrated use of different source of plant nutrients is required to check nutrient depletion, maintain soil fertility and crop productivity. Rotations shift the biological balance in the soil. Introduction of short duration legume crops in finger millet cropping system can be a better concept for new era. These pre kharif legumes supplement nitrogen needs of the succeeding crop besides improving soil physical and chemical properties. Grain legumes like green gram are more preferable as they offer short-term additional benefits to farmers and are equally beneficial in sustaining the productivity of finger millet cropping system.

MATERIALS AND METHODS

A field experiment was conducted at the College Farm, Navsari Agricultural University, Navsari during the year 2019 and 2020. The soil of the experimental field was clayey in texture, low in organic carbon (0.40 %) and available nitrogen (213.42 kg/ha), medium in available phosphorus (37.55 kg/ha) and high in available potassium (318.27 kg/ha). The soil was slightly alkaline in reaction (pH-7.96). The treatment consisted of integrated nutrient management viz., T1 - Absolute control, T2 - 100% RDF (20-40-00 NPK kg/ha), T3 – 100% RDF + bio-compost @ 2.5 t/ha, T4 – 100% RDF + bio-compost @ 2.5 t/ha + PSB (soil application @ 2.5 l/ha), T5 – 50 % RDF + bio-compost @ 2.5 t/ha, T6 – 50% RDF + bio-compost @ 2.5 t/ha + PSB (soil application @ 2.5 l/ha) to green gram in summer season as main plot treatment, replicated four times in randomized block design. During kharif season each main plot treatment was split into three sub plot treatments with three levels of recommended dose of fertilizer viz., F1 – 100 % RDF + crop residue incorporation (40-20-00 NPK kg/ha), F2 - 75% RDF + crop residue incorporation, F3 - 50% RDF + crop residue incorporation in finger millet resulting in eighteen treatment combinations replicated four times in split plot design. Nitrogen nutrient was applied through urea whereas phosphorus was applied through SSP as basal application. The desired

quantity of bio-compost was worked out as per treatments and bio fertilizer was thoroughly mixed with bio-compost. It was then uniformly spread and mixed in particular plots before sowing. The biometric observations were recorded on five randomly selected plants from the net plot. Samples for the observations that required destructive sampling were collected from the ring line and take from the net plot area. The mean values of all observations were utilized for statistical analysis by using statistical procedures as described by Panse and Sukhatme (1985). The treatment effects on all the characters under study were compared by employing 'F' – test and the data was analysed in randomised block design and split plot design.

RESULTS AND DISCUSSION

Effect on soil organic carbon:

The data regarding organic carbon content in soil after the harvest of finger millet crop as influenced by different treatments is presented in Table-1. Data presented in Table-1 shows that various INM treatments imposed in preceding green gram significantly influenced the soil organic carbon content after finger millet harvest during both the years. Though, treatment with 100 % RDF + bio-compost 2.5 t/ha with PSB 2.5 l/ha (T4) registered the higher values of organic carbon (0.538 and 0.544 %), it was statistically at par with treatment T3 in first year and with treatments T3, T2 and T6 in second year. It indicates that application of organic materials favorably influenced the organic carbon content in soil.

The results further revealed that different fertility levels in finger millet exerted their significant effect on soil organic carbon content during both the years. Crop fertilized either with 100 or 75 % RDF + crop residue incorporation (F1 and F2) was statistically at par and found equally good in improving organic carbon content after finger millet harvest in both the years.

Data in Table-1 further indicated that the interaction between INM treatments in preceding green gram and varying fertility levels in finger millet failed to reach level of significance for soil organic carbon content after both the years. These findings were in accordance with Upperi et al. (2011), Patel et al. (2016) and Barkha et al. (2020).

CONCLUSION:

On the basis of experimental results, it can be concluded that higher soil organic carbon recorded in summer green gram treatment of 100% RDF + bio-compost @ 2.5 t/ha + PSB (soil application @ 2.5 l/ha) (RDF: 20-40-00 N-P₂O₅-K₂O kg/ha) and kharif finger millet crop



should be fertilized with 100% RDF + crop residue incorporation (RDF: 40-20-00 N-P2O5-K2O kg/ha) in green gram – finger millet sequence under south Gujarat condition.

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Table -1 : Soil Organic Carbon and soil pH as influenced by different treatments of Integrated Nutrient Management

Treatments	Soil Organic Carbon (%)	
	2019	2020
Main plot (applied to green gram)		
T ₁ : Absolute control	0.407	0.416
T ₂ : 100% RDF	0.433	0.420
T ₃ : 100% RDF + Bio-compost @ 2.5 t/ha	0.536	0.542
T ₄ : 100% RDF + Bio-compost @ 2.5 t/ha + PSB (soil application 2.5 l/ha)	0.538	0.544
T ₅ : 50% RDF + Bio-compost @ 2.5 t/ha	0.454	0.479
T ₆ : 50% RDF + Bio-compost @ 2.5 t/ha+ PSB (soil application 2.5 l/ha)	0.475	0.510
SEm ±	0.013	0.020
CD (P=0.05)	0.040	0.058
CV (%)	5.64	5.84
Sub-plot (applied to finger millet)		
F ₁ : 100 % RDF + crop residue incorporation	0.501	0.517
F ₂ : 75 % RDF + crop residue incorporation	0.486	0.507
F ₃ : 50 % RDF + crop residue incorporation	0.474	0.481
SEm ±	0.008	0.009
CD (P=0.05)	0.024	0.028
Interaction (T × F)		
SEm ±	0.021	0.036
CD (P=0.05)	NS	NS
CV (%)	4.50	5.21
Initial value	0.38	0.40