

PERFORMANCE OF MAIZE BASED INTERCROPPING SYSTEM

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ABSTRACT

A field experiment has been performed during *kharif* 2024 at College Farm, College of Agriculture, Navsari Agricultural University, Campus Bharuch, for evaluating the performance of maize-based intercropping systems. The findings depicted that sole maize (T₁) recorded significantly higher plant height (197.5 cm), number of green leaves plant⁻¹ (13.8), dry matter production plant⁻¹ (109.28 g), cob weight (62.0 g), cob length (19.0 cm), cob girth (15.5 cm), grain yield (3567 kg ha⁻¹), straw yield (7692 kg ha⁻¹), that remained statistically at par with treatment T₂ (Maize+Black gram, 1:1) and T₅ (Maize+Green gram, 1:1). Among the intercropping treatments, Maize+Black gram (1:1) recorded the highest maize equivalent yield (4414 kg ha⁻¹), gross return (₹ 1,55,412 ha⁻¹), net return (₹ 1,09,865 ha⁻¹) along with a benefit-cost ratio (BCR) of 3.41 followed closely by Maize + Green gram (T₅) (3.29) and Sole maize (3.27). Significantly higher available nitrogen (283 kg ha⁻¹), phosphorus (47.18 kg ha⁻¹) were noticed in treatment T₁₁ - Maize + Soybean (1:2) that has been statistically at par with all other treatments except T₅ - Maize+Green gram (1:1), T₄ - Maize+Cowpea (1:1) and T₁ - Sole Maize.

(Key words: Intercropping, maize, MEY, economics)

INTRODUCTION

The world's population is expanding at exponential rate, which underscores need for increased productivity-boosting plan to meet their food needs, such as intercropping. In response to the growing demand for agricultural production, adopting high-intensity cropping approaches such as intercropping has become a key strategy. Intercropping contributes significantly to sustainable agriculture and global food security by enhancing land productivity, making more efficient use of available resources, lowering production risks, suppressing weed growth, and ensuring more stable yields.

A modern approach to intercropping focuses on optimizing the density of each crop by carefully designing its spatial arrangement. The amount of soil area allotted to each plant plays a crucial role in determining its development and final yield. Intercropping in maize offers several advantages over monocropping, including improved soil conservation, better lodging resistance, and effective weed control. In intercropping systems, the cereal component due to its relatively faster growth rate, greater height, and deeper rooting system often dominates in competition with the associated legume crop. Leguminous intercrops fix atmospheric nitrogen, enrich soil, and reduce requirement of chemical fertilizers, thereby promoting sustainable farming practices. Intercropping is insurance against crop fertility,

intercropping ensures more consistent income, better labor distribution, and increased total yield unit⁻¹ area compared to monocropping.

MATERIALS AND METHODS

Field experiment has been performed at College farm, Navsari Agricultural University, Campus Bharuch in plot number 11 (B) during the *kharif* 2024. The soil was slightly alkaline in nature pH (7.61), EC (0.32 dS m⁻¹), organic carbon (0.37%), low in available N (223 kg ha⁻¹), P₂O₅ (36.56 kg ha⁻¹), high in available K₂O (323 kg ha⁻¹). An experiment performed in randomized Complete Block Design as well as replicated thrice. Treatments were T₁ - Sole Maize (45 cm × 20 cm) T₂ - Maize+Black gram (1:1), T₃ - Maize+Groundnut (1:1), T₄ - Maize+Cowpea (1:1), T₅ - Maize+Green gram (1:1), T₆ - Maize+Soybean (1:1), T₇ - Maize+Black gram (1:2), T₈ - Maize+Groundnut (1:2), T₉ - Maize + Cowpea (1:2), T₁₀ - Maize+Green gram (1:2) and T₁₁ - Maize+Soybean (1:2). For this experiment cultivars used for maize - GAWMH-2, black gram - GU-3, groundnut- GJG-32, cowpea- GC-3, green gram - GM-7, soybean - NRC-37. Recommended dose of NPK was 100-50-00 kg ha⁻¹ for maize while, this value for sole intercrop was 20-40-00 kg ha⁻¹. Other agricultural practices was done according to recommended package of practices for both main and intercrop. 5 plants were tagged from every plot randomly for measuring plant height (cm) at 60 DAS and harvest, number of green leaves plant⁻¹ at harvest, dry matter

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production plant⁻¹(g) at 30DAS, 60DAS, harvest. Cob length and cob girth were taken utilizing measuring tape, cob weight was taken utilizing weight machine for dry matter production⁻¹ Five plants were uprooted from border line at 30 DAS, 60 DAS and harvest. After removing root and above ground plant parts were initially dried in sun and finally oven-dried at 65 °C until constant dry weight recorded individually. After harvesting cob collected from tagged five plants cob weight, length, girth were documented. From date of sowing until 50% of plants had tasselled, the number of days was noted. Net plots seed and stover yield data

were recorded and converted to kg ha⁻¹. Following crop harvest, chemical analyses of soil s available nitrogen, potassium, phosphorus status were conducted using variety of techniques, including Alkaline Permanganate Oxidation method for N (as proposed by Subbiah and Asija, 1956), Spectro photometric method for P (as proposed by Olsen *et al.*, 1954), Flame photometric method for K (as proposed by Jackson, 1979). The usual methods described by Panse and Sukhatme (1985) were used to statistically evaluate data. The following formula was used to compute the maize equivalent yield.

$$\text{Maize equivalent yield (kg ha}^{-1}\text{)} = \text{Yield of maize grain (kg ha}^{-1}\text{)} + \frac{\text{Yield of intercrop (kg ha}^{-1}\text{)} \times \text{Price of intercrop (₹ kg}^{-1}\text{)}}{\text{Price of maize crop (₹ kg}^{-1}\text{)}}$$

RESULTS AND DISCUSSION

Effect of intercropping on growth parameters

Data regarding growth parameters of maize as impacted through intercropping are present in Table 1. Significantly higher plant height of 127.3 cm and 197.5 cm at 60 DAS and at harvest respectively documented in sole maize and that was found statistically at par with intercropping treatments T₇-Maize + Black gram (1:2), T₁₀-Maize + Green gram (1:2), T₉-Maize + Cowpea (1:2), T₂-Maize + Black gram (1:1), T₅-Maize + Green gram (1:1). Highest number of green leaves plant⁻¹ (13.8) was recorded in sole maize (T₁) and found at par with treatment T₇-Maize + Black gram (1:2), T₁₀-Maize + Green gram (1:2), T₂-Maize + Black gram (1:1) and T₅-Maize + Green gram (1:1). Dry matter production plant⁻¹ *i.e.* 6.57, 60.63 and 109.28 g of maize at 30 DAS, 60 DAS, harvest, respectively was recorded in treatments T₁ that was statistically at par with treatments T₇-Maize + Black gram (1:2), T₁₀-Maize + Green gram (1:2), T₉-Maize + Cowpea (1:2), T₂-Maize + Black gram (1:1) and T₅-Maize + Green gram (1:1). Maximum value of growth parameters was documented in sole maize as result of absence of competition from intercrops. The maize plant height was significantly increased because of less competition for light, space, nutrients in sole maize. Introducing intercrops in maize recorded considerably lower dry matter production of maize than sole maize. Reason behind it was that intercrops were compete for natural recourse which leads to low plant height as well as dry matter production and reduced number of green leaves plant⁻¹. However, days of 50% tasseling of maize was not significantly affected due to intercropping system. Similar findings were detected by Vaghasiya *et al.* (2025), Satishkumar *et al.* (2021). Vaghasiya *et al.* (2025) observed significantly higher plant height of 139.98 and 229.37 cm at 60 DAS and at harvest, correspondingly have been recorded in sole sorghum (T₁), however it was at par with treatment T₈-Sorghum + Blackgram (1:2), T₇-Sorghum + Green gram (1:2), T₃-Sorghum + Blackgram (1:1), T₂-Sorghum + Green

gram (1:1), T₁₁-Sorghum + Cowpea (1:2) and T₉-Sorghum + Soybean (1:2). The number of green leaves plant⁻¹ (11.87) at harvest was observed in sole sorghum (T₁), however, this has was on par with treatment T₈-Sorghum + Black gram (1:2), T₇-Sorghum + Green gram (1:2), T₃-Sorghum + Black gram (1:1) and T₂-sorghum + Green gram (1:1) and dry matter production plant⁻¹ of 4.18, 57.64 and 189.13 g of sorghum at 30, 60 DAS and at harvest, correspondingly have been detected in sole sorghum (T₁) that was statistically at par with treatments T₈-Sorghum + Black gram (1:2), T₇-sorghum+Green gram (1:2), T₁₁-Sorghum + Cowpea (1:2), T₉-Sorghum + Soybean (1:2), T₃-Sorghum + Black gram (1:1) and T₂-Sorghum + Green gram (1:1). Satishkumar *et al.* (2021) observed that the taller plant of cotton (97.3 and 106.2 cm) during summer and winter was recorded in sole cotton and it was comparable with cotton + sesame intercropping system.

Effect of intercropping on yield attributes and yield of maize

Data present in Table 2 depicted that yield attribute *viz.*, cob weight (62.0 g), cob length (19 cm) and cob girth (15.5 cm) were recorded significantly higher with sole maize (T₁) planted at 45 cm×20 cm over 1:1 and 1:2 row intercropping system. This was statistically at par with treatments T₇ Maize + Black gram (1:2), T₁₀-Maize + Green gram (1:2), T₂-Maize + Black gram (1:1), T₅-Maize + Green gram (1:1) T₉-Maize + Cowpea (1:2), and T₄-Maize + Cowpea (1:1). However, the intercropping system had no effect on test weight of maize. This competition likely resulted in reduced growth parameters of maize under intercropping systems. The competition exerted by intercrops for vital natural resources, namely moisture, space, nutrients, solar radiation negatively influences the photosynthetic efficiency of the base crop, thereby reducing assimilate translocation to various metabolic sinks and ultimately resulting in lower yields. Conversely, sole maize cultivation, being free from such competitive stress, exhibited enhanced yield attributes and recorded the highest productivity. Identical findings were also demonstrated earlier by Sujathamma and Nedunchezhiyan (2022),

Vaghasiya *et al.* (2025). Sujathamma and Nedunchezhiyan (2022) found that sorghum as well as black gram intercropping either 2:2 or 1:1 ratio leads to increase grain yield of sorghum as compared to sorghum alone. Vaghasiya *et al.* (2025) informed that yield attributes, namely, ear heads length (25.81cm) and grain weight ear head (47.55 g) were recorded significantly higher with sole sorghum (T_1) planted at 45 cm \times 15 cm over 1:1 and 1:2 row intercropping system and this was statistically at par with treatments T_8 -Sorghum + Black gram (1:2), T_7 -Sorghum + Green gram (1:2), T_3 -Sorghum + Black gram (1:1) and T_2 -Sorghum + Green gram (1:1). However, the intercropping system had no effect on test weight and harvest index of sorghum.

Intercropping method resulted in significant variation in maize grain and stover yield. Maize alone produced highest grain as well as stover yield of maize (3567, 7692 kg ha⁻¹), that was statistically at par to treatments T_2 , T_5 and T_4 . The higher grain or stover yield detected in sole maize cropping could be attributed to improved overall plant growth, as indicated by enhanced growth and yield parameters. This might be because of lack of inter-specific competition, allowing more efficient utilization of essential sources, namely water, nutrients, sunlight. During intercropping, the maize has to compete with other crops, which can reduce its overall growth. Decline in maize grain yield under intercropping treatments may be attributed to lower values of all yield attributes, including test weight, cob weight, cob length, cob girth, which result in poor growth and yield because of intercrop s competition for resources with maize. Prior outcomes observed was similar to those of Prakash *et al.* (2019), Sujatha *et al.* (2018) Satishkumar *et al.* (2021), Vaghasiya *et al.* (2025). Prakash *et al.* (2019) revealed that the maize alone recorded significantly higher grain yield that was at par with maize + blackgram intercropping system. Sujatha *et al.* (2018) also exposed that transplanted pigeonpea at planting geometry of 120 cm x 60 cm spacing intercropped with soybean, green gram, black gram produced significantly higher grain yield in pigeonpea (2537, 2550, 2334 kg ha⁻¹, correspondingly) than direct sown pigeonpea intercropping with soybean, green gram, black gram at both at 120 cm x 60 cm geometry. Satishkumar *et al.* (2021) noticed that higher mean seed cotton yield of 1520 kg ha⁻¹ was observed in sole cotton and it was at par with cotton+sesame. Vaghasiya *et al.* (2025) stated that highest seed and stover yield of sorghum was observed with sole sorghum (3480,7492 kg ha⁻¹, correspondingly) that was statistically at par with treatments T_3 and T_2 .

Effect of intercropping on yield of intercrop

Data associated with seed yield (kg ha⁻¹) of intercrops under several intercropping systems are given in Table 3. Outcomes demonstrated that intercrops gave higher seed and haulm yields in the 1:2 replacement series as compared to the 1:1 additive series. This may be because, in the 1:2 system, 1 row of maize was replaced with 2 rows of intercrop, which reduced number of maize plants. As a result, there was less competition for water, nutrients and sunlight, allowing the intercrop to grow better and produce higher

yields. The highest seed and haulm yield was recorded by groundnut among the intercrops in 1:1 and 1:2 ratio of intercropping systems. The lowest seed and haulm yield was observed in green gram in 1:1 and 1:2 ratio of intercropping systems. Alike outcomes were observed earlier by Baishya *et al.* (2021), Panda *et al.* (2021). Baishya *et al.* (2021) stated that maximum grain yield of soybean (1.3 t ha⁻¹) and groundnut (1.3 t ha⁻¹) was observed under maize + soybean (1:1) and maize + groundnut (4:4) intercropping system. Panda *et al.* (2021) also exhibited that highest grain yield (690 kg ha⁻¹), haulm yield (1255 kg ha⁻¹) of groundnut were recorded under maize + groundnut (2:3) intercropping system.

Effect of intercropping on maize equivalent yield

MEY (4,414 kg ha⁻¹) of maize intercropped with black gram at 1:1 row ratio was significantly greater than groundnut and green gram 1:1 row intercropping system. It may be consequence of additional yield of intercrop and higher yield of maize with black gram due to better complementary relationship resulted elevated maize grain equivalent yield. Lower MEY was recorded in 1:2 intercropping system because of maize plant stand was 50 per cent reduced as compared to 1:1 row intercropping system. Similar outcomes was also observed earlier by Prakash *et al.* (2019), Nakat *et al.* (2023), Vaghasiya *et al.* (2025). Prakash *et al.* (2019) stated that maize + black gram observed significantly higher total maize equivalent yield. However, this was statistically at par with sorghum + green gram. Nakat *et al.* (2023) observed that mustard intercropped with chick pea in row ratio of 5:2 recorded significantly highest mustard equivalent yield of 23.81 q ha⁻¹ than all intercropping systems and row ratios. Vaghasiya *et al.* (2025) reported that sorghum intercropped with blackgram at 1:1 row ratio was produced significantly higher sorghum grain equivalent yield (4271 kg ha⁻¹) and at par with all 1:1 row intercropping system viz., T_2 - Sorghum + Greengram (1:1), T_3 - Sorghum + Blackgram (1:1), T_4 - Sorghum + Soybean (1:1), T_5 - Sorghum + Mothbean (1:1) and T_6 Sorghum + Cowpea (1:1).

Available nutrient in soil after harvest

Generally, an improvement in available soil nutrients was observed in all intercropping treatments compared to sole maize. Result in Table 3 revealed that significantly higher available nitrogen (283 kg ha⁻¹) and phosphorus (47.18 kg ha⁻¹) was noticed in treatment T_{11} - Maize + Soybean (1:2) that was statistically at par with all other treatments except T_5 Maize + Green gram (1:1), T_4 - Maize + Cowpea (1:1) and T_1 - Sole Maize. The improved nitrogen status in intercropped treatments except T_2 - Maize + Black gram (1:1), T_5 - Maize + Green gram (1:1), T_4 - Maize + Cowpea (1:1) and T_1 - Sole Maize. Enhanced nitrogen status in intercropped treatments may result from mineralization of nitrogen from organic residues in soil and atmospheric nitrogen fixation via rhizobium bacteria in nodules on their roots. The higher available P_2O_5 content in the soil under intercropping systems might be due to breakdown of organic matter, which releases root exudates and organic acids that help in mineralizing native phosphorus. Additionally,

Table 1. Effect of intercropping on growth and yield parameters of maize

| Treatments | Plant height (cm) | | Number of green leaves plant ⁻¹ at harvest | Dry matter production (g plant ⁻¹) | | Days to 50% tasseling |
|---|-------------------|------------|--|--|--------|--------------------------|
| | 60 DAS | At harvest | | 30 DAS | 60 DAS | |
| T ₁ : Sole Maize (45 cm × 20 cm) | 127.3 | 197.5 | 13.8 | 60.53 | 109.28 | 52.6 |
| T ₂ : Maize + Black gram (1:1) | 119.3 | 181.4 | 12.5 | 55.78 | 100.35 | 52.2 |
| T ₃ : Maize + Groundnut (1:1) | 97.5 | 150.3 | 10.7 | 46.35 | 90.53 | 49.1 |
| T ₄ : Maize + Cowpea (1:1) | 104.2 | 166.6 | 11.5 | 51.07 | 97.08 | 50.6 |
| T ₅ : Maize + Green gram (1:1) | 114.5 | 180.1 | 12.5 | 55.25 | 99.15 | 52.1 |
| T ₆ : Maize + Soybean (1:1) | 101.3 | 158.5 | 11.2 | 47.77 | 93.07 | 50.0 |
| T ₇ : Maize + Black gram (1:2) | 122.8 | 187.7 | 12.8 | 56.68 | 103.52 | 52.2 |
| T ₈ : Maize + Groundnut (1:2) | 100.4 | 160.3 | 11.1 | 51.02 | 91.93 | 49.6 |
| T ₉ : Maize + Cowpea (1:2) | 112.9 | 179.9 | 12.5 | 53.80 | 99.15 | 51.6 |
| T ₁₀ : Maize + Green gram (1:2) | 117.3 | 182.6 | 12.4 | 55.92 | 103.18 | 50.3 |
| T ₁₁ : Maize + Soybean (1:2) | 103.2 | 173.9 | 11.9 | 52.95 | 96.10 | 51.3 |
| SE(m) ± | 5.1 | 6.8 | 0.6 | 2.49 | 3.64 | 1.4 |
| CD (p=0.05) | 15.3 | 20.4 | 1.8 | 7.47 | 10.92 | - |

Table 2. Effect of intercropping on yield parameters, yields and available nutrients after harvest of maize

| Treatments | Cob weight (g) | Cob length (cm) | Cob girth (cm) | Test weight (g) | Grain yield (kg ha ⁻¹) | Stover yield (kg ha ⁻¹) | Available N (kg ha ⁻¹) | Available P ₂ O ₅ (kg ha ⁻¹) | Available K ₂ O (kg ha ⁻¹) |
|--|----------------|-----------------|----------------|-----------------|------------------------------------|-------------------------------------|------------------------------------|--|---|
| | | | | | | | | | |
| T ₂ : Maize + Black gram (1:1) | 56.6 | 18.6 | 14.4 | 22.2 | 3372 | 7288 | 256 | 42.90 | 316 |
| T ₃ : Maize + Groundnut (1:1) | 51.4 | 15.7 | 12.0 | 20.2 | 3067 | 6295 | 263 | 43.42 | 320 |
| T ₄ : Maize + Cowpea (1:1) | 56.0 | 18.0 | 14.0 | 21.8 | 3128 | 6735 | 258 | 40.38 | 311 |
| T ₅ : Maize + Green gram (1:1) | 56.3 | 18.5 | 14.2 | 22.1 | 3264 | 7067 | 254 | 41.80 | 317 |
| T ₆ : Maize + Soybean (1:1) | 53.8 | 16.1 | 12.8 | 21.2 | 3086 | 6435 | 266 | 45.77 | 322 |
| T ₇ : Maize + Black gram (1:2) | 58.6 | 18.9 | 14.7 | 22.3 | 2014 | 4228 | 272 | 44.25 | 321 |
| T ₈ : Maize + Groundnut (1:2) | 51.4 | 16.3 | 13.0 | 20.7 | 1764 | 3411 | 280 | 45.88 | 323 |
| T ₉ : Maize + Cowpea (1:2) | 56.1 | 18.3 | 14.1 | 22.0 | 1866 | 3761 | 276 | 42.08 | 315 |
| T ₁₀ : Maize + Green gram (1:2) | 58.1 | 18.6 | 14.5 | 22.8 | 1971 | 4065 | 269 | 42.97 | 321 |
| T ₁₁ : Maize + Soybean (1:2) | 52.0 | 16.5 | 13.1 | 21.4 | 1875 | 3673 | 283 | 47.18 | 325 |
| SE(m) ± | 2.1 | 0.7 | 0.7 | 0.73 | 161.7 | 365.1 | 8.0 | 1.53 | 7.92 |
| CD (p=0.05) | 6.3 | 2.1 | 2.1 | - | 485.1 | 1095.0 | 24.0 | 4.59 | - |

Table 3. Effect of intercropping on maize grain equivalent yield and economics of maize

| Treatments | Intercrop seed yield (kg ha ⁻¹) | Intercrop haulm yield (kg ha ⁻¹) | Maize grain equivalent yield (kg ha ⁻¹) | Gross returns (₹ ha ⁻¹) | Net returns (₹ ha ⁻¹) | B:C ratio |
|---|---|--|---|-------------------------------------|-----------------------------------|-----------|
| T ₁ : Sole Maize (45 cm × 20 cm) | - | - | 3567 | 140010 | 97143 | 3.27 |
| T ₂ : Maize + Black gram (1:1) | 310 | 602 | 4414 | 155412 | 109865 | 3.41 |
| T ₃ : Maize + Groundnut (1:1) | 470 | 805 | 4391 | 146962 | 96935 | 2.94 |
| T ₄ : Maize + Cowpea (1:1) | 267 | 506 | 3784 | 137128 | 91101 | 2.98 |
| T ₅ : Maize + Green gram (1:1) | 259 | 489 | 4123 | 147242 | 102555 | 3.29 |
| T ₆ : Maize + Soybean (1:1) | 370 | 763 | 3910 | 137500 | 90473 | 2.92 |
| T ₇ : Maize + Black gram (1:2) | 530 | 889 | 3796 | 117336 | 77537 | 2.95 |
| T ₈ : Maize + Groundnut (1:2) | 636 | 1230 | 3556 | 105520 | 58121 | 2.23 |
| T ₉ : Maize + Cowpea (1:2) | 495 | 804 | 3081 | 97870 | 58471 | 2.48 |
| T ₁₀ : Maize + Green gram (1:2) | 478 | 740 | 3557 | 110774 | 71375 | 2.81 |
| T ₁₁ : Maize + Soybean (1:2) | 566 | 1089 | 3132 | 98288 | 56889 | 2.37 |
| S.E.(m) ± | - | - | 164.7 | - | - | - |
| CD (p=0.05) | - | - | 493 | - | - | - |

Selling Price : Maize- Grain: ₹ 22 kg⁻¹, Stover: ₹ 8 kg⁻¹, **Black gram-** Grain: ₹ 74 kg⁻¹, Haulm: ₹ 10 kg⁻¹, **Groundnut-** Grain: ₹ 62 kg⁻¹, Haulm: ₹ 8 kg⁻¹, **Cowpea-** Grain: ₹ 54 kg⁻¹, Haulm: ₹ 10 kg⁻¹, **Greengram-** Grain: ₹ 73 kg⁻¹, Haulm: ₹ 10 kg⁻¹, **Soybean-** Grain: ₹ 49 kg⁻¹, Haulm: ₹ 10 kg⁻¹

availability of legume crops in intercropping system elevates soil microbial activity, which also contributes to better phosphorus availability. Similar outcomes were noted by Vaghasiya *et al.* (2025). They stated that significantly higher available nitrogen (286 kg ha⁻¹) and phosphorus (42.77 kg ha⁻¹) was observed with treatment T₉-Sorghum + soybean (1:2) that was statistically at par with all other treatments except T₃-Sorghum + Black gram (1:1), T₂-Sorghum + Green gram (1:1) and T₁-Sole sorghum with respect to available nitrogen while in case of phosphorus, it stayed at par with all other treatments except T₂-Sorghum + Green gram (1:1) and T₁-Sole Sorghum.

Economics

Data regarding economics as impacted through various intercropping treatment are given in Table 4. Data clearly indicated that the highest gross returns (₹1,55,412 ha⁻¹) and net returns (₹1,09,865 ha⁻¹) having higher BCR of 3.41 was accrued under treatment T₂ - Maize + Black gram followed by treatment T₅ - Maize + Green gram grown at 1:1 ratio intercropping systems. Victor *et al.* (2023) found that intercropping system of pearl millet + black gram (4:1) observed higher net returns (₹ 81,621 ha⁻¹) and B : C ratio (2.42). Sujathamma and Nedunchezhiyan (2022) concluded that 2:2 ratio of sorghum and black gram recorded highest net returns (₹ 45,645 ha⁻¹) followed by 1:1 ratio of sorghum and black gram. According to Ankushdeep and Kumar (2022) maximum gross return (₹1,42,889 ha⁻¹), net return (₹1,05,694 ha⁻¹), B:C ratio (3.85) was recorded in wheat + chick pea (2:1) row ratio than all other intercropping system.

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