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# Evaluation of pigeonpea (*Cajanus cajan* L.) based intercropping systems in Krishna district of Andhra Pradesh

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**Abstract**
A field experiment was conducted during three *kharif* seasons during 2016-17 to 2018-19 at Agricultural Research Station, Garikapadu, Krishna district, ANGRAU, with an objective to evaluate the performance of different intercrops with pigeonpea and to find out the suitable intercrop with pigeonpea. Among the various pigeonpea intercropping systems, Pigeonpea + cowpea (1:5) was found superior with mean maximum pigeonpea equivalent yield 2026 kg/ha and mean maximum rainwater use efficiency of 2.84 kg/ha-mm compared to other intercropping systems. Maximum net returns of Rs.75,555/ha and benefit-cost ratio 2.57 was also recorded with Pigeonpea + cowpea (1:5) intercropping system. Further, this intercropping system also recorded relatively higher land equivalent ratio of 3.27 indicating yield advantage of 27% compared to sole crops.

**Keywords:** Pigeonpea intercropping systems, PEY, LER, RWUE, Economics

## Introduction
Pigeonpea (*Cajanus cajan* L.) also known as arhar, tur or red gram is one of the most important *kharif* pulse crop cultivated in India. It occupies a prime niche in sustainable farming systems of small and marginal rainfed farmers. It is next to only chickpea in area and production among the entire pulse crop grown in India. It is cultivated under diverse agro climatic conditions either as sole or in mixtures with cereals, millets, pulses or oilseeds under rainfed conditions. Pigeonpea grown as a sole crop is not economically viable because of its slow initial growth rate, low productivity and longer duration during which the more rapidly growing short duration and short stature crops like greengram, blackgram, cowpea, soybean, sorghum, bajra and korra can be conveniently intercropped to utilize the natural resources most efficiently in the early stages of pigeonpea intercropping system. Intercropping with short duration pulses like greengram and cereals like pear millet in pigeonpea enhance total productivity (Sharma *et al.*, 1995). Intercropping involves growing two or more crops or varieties simultaneously on the same piece of land with definite row ratio. Crop intensification is in both time and space dimensions. There is intercrop competition during all part of crop growth (Prasad and Shrivastava, 2011) [3]. Intercropping provides insurance against drought, modifies soil environment, improves moisture and radiation use, ensure better weed control, reduces disease and pest incidence and in whole increases and stabilizes the productivity. Intercropping has been identified as a kind of biological insurance against risks under aberrant rainfall behaviour. Crop diversification is also necessary to get higher yield and return to maintain soil health, conserve natural resources, preserve environment, meet daily food requirement of human and animals, withstand price fluctuation and ensure constant flow of income (Siddique *et al.*, 2012) [4]. In Krishna zone of Andhra Pradesh pigeonpea is cultivated during *kharif* under diverse biophysical (soil and rainfall types) and socioeconomic settings, thus always risk prone due to in - season drought, particularly in the shallow to medium deep red soils often resulting in unsustainable yields and income. Thus, it becomes necessary to develop an efficient and profitable pigeonpea based intercropping system for Krishna zone of Andhra Pradesh.

## Materials and Methods
A field experiment was conducted during three *kharif* seasons during 2016-17 to 2018-19 at Agricultural Research Station, Garikapadu, Krishna district, ANGRAU with an objective to evaluate the performance of different intercrops with pigeonpea and to find out the suitable intercrop with pigeonpea.

The experimental site was characterized as red sandy loams with shallow depth (25-30 cm) with water holding capacity 14.5%, well drained in nature, $P^H$ 6.9, EC 0.14 ds $m^{-1}$, Organic carbon 0.48%, low in available Nitrogen (149-193 kg/ha), medium to high in available phosphorus (16.4-28.3 kg/ha) and potassium (155-349 kg/ha). The treatments consisting of 7 inter pigeonpea cropping systems with intercrops like greengram, blackgram, cowpea, soyabean, sorghum, bajra, korra, and 8 sole crop treatments, total 15 treatments were studied in RBD design and replicated thrice. Pigeonpea variety LRG-52, Greengram variety IPM 2-14, Blackgram variety LBG 787, Cowpea variety TPTC-29, Soybean variety JS335, Sorghum variety NTJ-5, Bajra variety ABV04, Korra variety SiA3222 were used. After every one row of pigeonpea five rows of greengram, blackgram, cowpea, soybean, korra, while two rows of sorghum and bajra after every row of pigeonpea evaluated. The optimum plant population was maintained by thinning and gap filling at 10 days after germination. For sole crop, recommended dose of fertilizers was applied and for intercrop, which crop recommended fertilizer dose was maximum that fertilizer dose was applied. Weeds were controlled by adoption of two hand weedings. The sowing of intercrop and sole crop during the 2016-17, 2017-18 and 2018-19 *viz.*, pigeonpea, greengram, blackgram, cowpea, soybean, sorghum, bajra and korra was sown 30.06.2016, 22.06.2017 and 29.06.2018 respectively and harvested after attaining physical maturity. The monthly actual and normal rainfall at ARS, Garikapadu during the experimentation period is given in Table 1. During 2016-17 (June to January), total rainfall received was 746.9 mm in 43 rainy days which was surplus by 5.27% against normal rainfall (709.5 mm), while during the *kharif*, total rainfall received was 677.9 mm in 38 rainy days which was deficit by 4.45% against normal rainfall (709.5 mm). During 2017-18 total rainfall received was 723.9 mm in 43 rainy days which was surplus by 2.02% against normal rainfall (709.5 mm), while during the *kharif*, total rainfall received was 618.9 mm in 37 rainy days which was deficit by 12.7% against normal rainfall (709.5 mm). During 2018-19 total rainfall received was 647.3 mm in 43 rainy days which was deficit by 8.76% against normal rainfall (709.5 mm), while during the *kharif*, total rainfall received was 555.3 mm in 37 rainy days which was deficit by 21.73% against normal rainfall (709.5 mm). Different competition indices were calculated as described by Willy (1979) [6]. Pigeonpea equivalent yield (PEY) was worked out by converting the yields of intercrops to the yield of pigeonpea on the basis of prevailing market price of each crop. It was calculated with the following formula.

PEY = (Yield of intercrop × price of intercrop/ price of pigeonpea) + Yield of pigeonpea.

The land equivalent ratio (LER) is sum of fraction of the yields of intercrops, relative to their sole crop yields. It is calculated with the following formula.

LER = (Yield of pigeonpea in intercropping system/ yield of sole pigeonpea) + (Yield of intercrops in intercropping system/yield of sole intercrops).

The rainwater use efficiency (kg/ha mm) of a crop or cropping system was determined by considering the pigeonpea equivalent yield (kg/ha) attained by the system and crop seasonal rainfall (mm) received from sowing to harvest of a given crop or the long duration crop in the cropping system. It is given as a ratio of the pigeonpea equivalent yield and the crop seasonal rainfall of a crop. The cost of cultivation (Rs/ha) incurred under sole and intercropping systems was divided by taking into account all the costs involved for different agricultural inputs and operations. The value of different crops in sole and intercropping systems was considered to derive the gross returns (Rs/ha), net returns (Rs/ha) and cost-benefit ratio.

## Results and Discussion

### Yield of component crops and pigeonpea equivalent yield of intercropping systems

Among the pigeonpea based intercropping systems, higher grain (791 kg/ha) and straw yield (2839 kg/ha) of cowpea as a intercrop was recorded in Pigeonpea + cowpea (1:5) system (Table 3).The erect growing and short duration crop foxtail millet and might have avoided the shading effect of the slow growing pigeonpea. The taller bajra or sorghum component of the intercrop might have extended depressive effects through shading of the shorter and slower growing pigeonpea component. Hence the pigeonpea yield under Pigeonpea + sorghum (1:2) intercropping system and Pigeonpea + bajra (1:2) intercropping system was low 1415 and 1441 kg/ha respectively compare to the pigeonpea yields with other intercrops i.e., greengram, blackgram , cowpea and sorghum. Mahto *et.al.*, 2007 also conducted field experiment and concluded that fingermillet recorded highest component yields in pigeonpea + fingermillet (1:5) system which are in similar line of results observed.

Pigeonpea equivalent yields was significantly differed with various pigeonpea based intercropping systems were presented in Table.4. Significantly higher mean pigeonpea equivalent yields 2026 kg/ha was recorded with Pigeonpea + cowpea (1:5) intercropping system followed by Pigeonpea + greengram (1:5) 1848 kg/ha and 1729 kg/ha with Pigeonpea + foxtail millet (1:5). The increase in pigeonpea equivalent yield in Pigeonpea + cowpea (1:5) intercropping system might be due to no or low competition between main crop and intercrop for growth as pulses was short duration crop with less competition for light and nutrients compare to the tall crops like sorghum and bajra. Kathmale *et al.*, 2014 [1] reported that pigeonpea equivalent yields significantly higher with pigeonpea + groundnut intercropping system (1:3) by utilizing both below and above groundnut environment.

### Land equivalent ratio

The Land equivalent ratio (LER) for the 2016-17, 2017-18 and 2018-19 and pooled mean were calculated and presented in Table.4. The Land equivalent ratio (LER) obtained in all the intercropping systems was more than one ranging from 1.0 to 3.27 indicating yield advantage with pigeonpea based intercropping systems. This yield advantage owing to intercropping might be attributed to balanced competition and better utilization of available resources than sole cropping resulting in higher productivity/unit area. The maximum LER of 3.27 was obtained with Pigeonpea + cowpea (1:5) intercropping system followed by Pigeonpea + soyabean (1:5) 2.97 which is on par with Pigeonpea + blackgram (1:5) 2.95, Pigeonpea + greengram (1:5) 2.80 but was significantly higher than the LER (1.99) attained with Pigeonpea + sorghum (1:2) and LER (1.78) with Pigeonpea + korra (1:5) system (Table 4). Similar results of higher LER were reported in pigeonpea + greengram (1:3) ratio (Udhaya and Kuzhanthaivel, 2015) [5].

**Rain water use efficiency**

Rainwater use efficiency (RWUE) was estimated for the years 2016-17,2017-18 and 2018-19 and pooled mean and the results were presented in Table.5. The rainwater use efficiency (RWUE) attained with pigeonpea based intercropping systems, in general was higher as compared to rainwater use efficiency attained with sole crops. This indicated higher resource use efficiency of both rainfall and soil moisture by both the component crops during the crop season. The mean maximum RWUE of 2.84 kg/ha-mm was obtained with Pigeonpea + cowpea (1:5) intercropping system followed by Pigeonpea + greengram (1:5) intercropping system (2.61 kg/ha-mm) and Pigeonpea + korra (1:5) intercropping system (2.42 kg/ha-mm). Similarly Kathmale *et al.*, 2014 [1] also reported that higher RWUE of (3.19 kg/ha-mm) was observed in pigeonpea + groundnut (1:3) intercropping system. The rainwater use efficiency was higher in intercropping with legume crops compared to erect crops like sorghum and bajra. The legumes as intercrops acted as cover crops in widely row spaced pigeonpea resulting in higher *in-situ* moisture conservation and efficient utilization by both the component crops, further helped in increased pigeonpea equivalent yields and higher rainwater use efficiency.

**Economics**

Among the various pigeonpea intercropping systems, Pigeonpea + cowpea (1:5) system recorded higher net returns (Rs.75,555/ha) and benefit-cost ratio (2.57) followed by Pigeonpea + greengram (1:5) intercropping system (net returns Rs.65332/ha) and benefit-cost ratio (2.38) (Table 6).

**Table 1:** Monthly rainfall (mm) received from sowing to harvest at ARS, Garikapadu

| Month | 2016-17 | | 2017-18 | | 2018-19 | | Pooled mean | |
|---|---|---|---|---|---|---|---|---|
| | Normal (mm) | Actual (mm) | Normal (mm) | Actual (mm) | Normal (mm) | Actual (mm) | Normal (mm) | Actual (mm) |
| June | 101.6 | 108 | 101.6 | 159.8 | 101.6 | 94.7 | 101.6 | 120.8 |
| July | 170.3 | 127.4 | 170.3 | 214.6 | 170.3 | 131.8 | 170.3 | 157.9 |
| August | 167.9 | 101 | 167.9 | 185.7 | 167.9 | 286.8 | 167.9 | 191.6 |
| September | 147.6 | 341.5 | 147.6 | 58.8 | 147.6 | 42.0 | 147.6 | 147.4 |
| October | 79.6 | 69.0 | 79.6 | 105.0 | 79.6 | 5.0 | 79.6 | 59.6 |
| November | 27.0 | 0.0 | 27.0 | 0.0 | 27.0 | 16.0 | 27.0 | 5.3 |
| December | 10.3 | 0.0 | 10.3 | 0.0 | 10.3 | 40.0 | 10.3 | 13.3 |
| January | 5.2 | 0.0 | 5.2 | 0.0 | 5.2 | 31.0 | 5.2 | 10.3 |
| Total | 709.5 | 746.9 | 709.5 | 723.9 | 709.5 | 647.3 | 709.5 | 706.2 |

**Table 2:** Main crop grain and straw/haulm yield as influenced by different intercropping systems

| Treatments | Main crop grain yield (kg/ha$^{-1}$) | | | | Main crop straw/haulm yield (kg/ha$^{-1}$) | | | |
|---|---|---|---|---|---|---|---|---|
| | 2016-17 | 2017-18 | 2018-19 | Pooled mean | 2016-17 | 2017-18 | 2018-19 | Pooled mean |
| Pigeonpea+ Greengram (1:5) | 1516 | 912 | 1072 | 1166 | 5376 | 3375 | 3741 | 4164 |
| Pigeonpea + blackgram (1:5) | 1508 | 879 | 785 | 1056 | 5338 | 3331 | 2888 | 3853 |
| Pigeonpea + cowpea (1:5) | 1611 | 985 | 1295 | 1269 | 5864 | 3733 | 4649 | 4644 |
| Pigeonpea + soyabean (1:5) | 1490 | 787 | 585 | 954 | 5424 | 2825 | 2205 | 3482 |
| Pigeonpea + sorghum (1:2) | 1477 | 750 | 560 | 929 | 5125 | 2745 | 2106 | 3326 |
| Pigeonpea + bajra (1:2) | 1482 | 727 | 635 | 947 | 5316 | 2653 | 2311 | 3425 |
| Pigeonpea + korra (1:5) | 1470 | 720 | 683 | 973 | 5158 | 2692 | 2554 | 3468 |
| Sole Pigeonpea | 1765 | 1028 | 1135 | 1309 | 6248 | 3722 | 4244 | 4842 |
| Sole Greengram | 785 | 627 | 529 | 647 | 2551 | 1724 | 1423 | 1899 |
| Sole Blackgram | 532 | 711 | 436 | 560 | 1723 | 1834 | 1120 | 1559 |
| Sole Cowpea | 829 | 622 | 391 | 614 | 2702 | 2621 | 1219 | 1980 |
| Sole Soyabean | 413 | 704 | 635 | 583 | 1548 | 1999 | 1892 | 1813 |
| Sole Sorghum | 1209 | 827 | 652 | 897 | 4570 | 3092 | 2343 | 3335 |
| Sole Bajra | 944 | 878 | 728 | 851 | 2416 | 2853 | 2497 | 2589 |
| Sole Korra | 1306 | 1285 | 991 | 1193 | 3643 | 3315 | 2735 | 3232 |
| SEm± | 53.0 | 44.98 | 39.8 | 88.0 | 272 | 102 | 119 | 133 |
| CD (P=0.05) | 156.0 | 138 | 122 | 258.0 | NS | 257 | 351 | 391 |
| CV% | 13.0 | 9.18 | 8.00 | 12.6 | 11.5 | 12.3 | 10.8 | 11.7 |

**Table 3:** Intercrop grain and straw/haulm yield as influenced by different intercropping systems

| Treatments | Intercrop grain yield (kg/ha$^{-1}$) | | | | Intercrop straw/haulm yield (kg/ha$^{-1}$) | | | |
|---|---|---|---|---|---|---|---|---|
| | 2016-17 | 2017-18 | 2018-19 | Pooled mean | 2016-17 | 2017-18 | 2018-19 | Pooled mean |
| Pigeonpea + Greengram (1:5) | 639 | 540 | 481 | 533 | 1596 | 1351 | 1251 | 1399 |
| Pigeonpea + blackgram (1:5) | 487 | 610 | 323 | 473 | 1222 | 1482 | 847 | 1182 |
| Pigeonpea + cowpea (1:5) | 712 | 545 | 275 | 510 | 1857 | 1388 | 683 | 1309 |
| Pigeonpea + soyabean (1:5) | 319 | 610 | 478 | 469 | 785 | 1647 | 1242 | 1225 |
| Pigeonpea + sorghum (1:2) | 1015 | 692 | 505 | 737 | 2767 | 1868 | 1283 | 1473 |
| Pigeonpea + bajra (1:2) | 855 | 790 | 611 | 752 | 2334 | 2480 | 2187 | 2333 |
| Pigeonpea + korra (1:5) | 1241 | 1130 | 839 | 791 | 3052 | 2983 | 2483 | 2839 |

**Table 4:** Pigeonpea equivalent yield (REY) and Land equivalent ratio (LER) as influenced by different intercropping systems

| Treatments | Pigeonpea equivalent yield (REY) (kg/ha$^{-1}$) | | | | Land equivalent ratio (LER) | | | |
|---|---|---|---|---|---|---|---|---|
| | 2016-17 | 2017-18 | 2018-19 | Pooled mean | 2016-17 | 2017-18 | 2018-19 | Pooled mean |
| Pigeonpea+ Greengram (1:5) | 2314 | 1557 | 1673 | 1848 | 2.93 | 2.45 | 3.02 | 2.80 |
| Pigeonpea + blackgram (1:5) | 2049 | 1587 | 1143 | 1593 | 3.83 | 2.23 | 2.80 | 2.95 |
| Pigeonpea + cowpea (1:5) | 2628 | 1763 | 1687 | 2026 | 2.94 | 2.58 | 4.31 | 3.27 |
| Pigeonpea + soyabean (1:5) | 1889 | 1527 | 1182 | 1532 | 4.90 | 2.11 | 1.92 | 2.97 |
| Pigeonpea + sorghum (1:2) | 2038 | 1269 | 938 | 1415 | 2.23 | 1.90 | 1.85 | 1.99 |
| Pigeonpea + bajra (1:2) | 1794 | 1385 | 1145 | 1441 | 2.56 | 1.82 | 1.87 | 2.08 |
| Pigeonpea + korra (1:5) | 2356 | 1549 | 1282 | 1729 | 2.12 | 1.56 | 1.68 | 1.78 |
| Sole Pigeonpea | 1765 | 1028 | 1135 | 1309 | 1.0 | 1.0 | 1.0 | 1.0 |
| Sole Greengram | 706 | 705 | 661 | 691 | 1.0 | 1.0 | 1.0 | 1.0 |
| Sole Blackgram | 473 | 727 | 485 | 562 | 1.0 | 1.0 | 1.0 | 1.0 |
| Sole Cowpea | 900 | 888 | 559 | 782 | 1.0 | 1.0 | 1.0 | 1.0 |
| Sole Soyabean | 372 | 880 | 794 | 682 | 1.0 | 1.0 | 1.0 | 1.0 |
| Sole Sorghum | 756 | 579 | 489 | 608 | 1.0 | 1.0 | 1.0 | 1.0 |
| Sole Bajra | 629 | 673 | 607 | 636 | 1.0 | 1.0 | 1.0 | 1.0 |
| Sole Korra | 653 | 826 | 708 | 729 | 1.0 | 1.0 | 1.0 | 1.0 |
| SEm± | 87.20 | 72.21 | 63.2 | 90.5 | 0.01 | 0.01 | 0.02 | 0.01 |
| CD (P=0.05) | 264 | 221 | 194 | 277 | 0.03 | 0.03 | 0.06 | 0.03 |
| CV% | 8.0 | 8.6 | 7.2 | 9.7 | 12.0 | 11.6 | 9.7 | 13.3 |

**Table 5:** Rainwater use efficiency (kg/ha-mm) as influenced by different intercropping systems

| Treatments | Rainwater use efficiency (kg/ha-mm) | | | |
|---|---|---|---|---|
| | 2016-17 | 2017-18 | 2018-19 | Pooled mean |
| Pigeonpea+ Greengram (1:5) | 3.10 | 2.15 | 2.60 | 2.61 |
| Pigeonpea + blackgram (1:5) | 2.74 | 2.19 | 1.80 | 2.24 |
| Pigeonpea + cowpea (1:5) | 3.51 | 2.43 | 2.60 | 2.84 |
| Pigeonpea + soyabean (1:5) | 2.52 | 2.10 | 1.82 | 2.14 |
| Pigeonpea + sorghum (1:2) | 2.72 | 1.75 | 1.44 | 1.97 |
| Pigeonpea + bajra (1:2) | 2.40 | 1.91 | 1.77 | 2.02 |
| Pigeonpea + korra (1:5) | 3.15 | 2.13 | 1.98 | 2.42 |
| Sole Pigeonpea | 2.36 | 1.42 | 1.75 | 1.84 |
| Sole Greengram | 1.05 | 0.86 | 0.78 | 0.91 |
| Sole Blackgram | 0.71 | 0.98 | 0.67 | 0.79 |
| Sole Cowpea | 1.10 | 0.85 | 0.60 | 0.86 |
| Sole Soyabean | 0.55 | 0.97 | 0.98 | 0.82 |
| Sole Sorghum | 1.61 | 1.14 | 1.01 | 1.27 |
| Sole Bajra | 1.26 | 1.12 | 1.12 | 1.21 |
| Sole Korra | 1.74 | 1.77 | 1.53 | 1.68 |
| SEm± | 87.20 | 72.21 | 63.2 | 90.5 |
| CD (P=0.05) | 264 | 221 | 194 | 277 |
| CV% | 8.0 | 8.6 | 7.2 | 9.7 |

**Table 6:** Cost economics of Pigeonpea based inter cropping systems (2016-17 to 2018-19) (Pooled)

| Treatments | Redgram equivalent yield (REY) (kg/ha$^{-1}$) | Cost of cultivation (Rs/ha) | Gross Returns (Rs/ha) | Net Returns (Rs/ha) | C:B Ratio |
|---|---|---|---|---|---|
| Pigeonpea+ Greengram (1:5) | 1848 | 47396 | 112728 | 65332 | 2.38 |
| Pigeonpea + blackgram (1:5) | 1593 | 49275 | 97173 | 47898 | 1.97 |
| Pigeonpea + cowpea (1:5) | 2026 | 48031 | 123586 | 75555 | 2.57 |
| Pigeonpea + soyabean (1:5) | 1532 | 46271 | 93452 | 47181 | 2.02 |
| Pigeonpea + sorghum (1:2) | 1415 | 52309 | 86315 | 34006 | 1.65 |
| Pigeonpea + bajra (1:2) | 1441 | 48654 | 87901 | 39247 | 1.81 |
| Pigeonpea + korra (1:5) | 1729 | 42772 | 105469 | 62697 | 2.47 |
| Sole Pigeonpea | 1309 | 39205 | 79849 | 40644 | 2.04 |
| Sole Greengram | 691 | 27562 | 42151 | 14589 | 1.53 |
| Sole Blackgram | 562 | 28106 | 34282 | 6176 | 1.22 |
| Sole Cowpea | 782 | 26179 | 47702 | 21523 | 1.82 |
| Sole Soyabean | 682 | 29205 | 41602 | 12397 | 1.42 |
| Sole Sorghum | 608 | 32030 | 37088 | 5058 | 1.16 |
| Sole Bajra | 636 | 29585 | 38796 | 9211 | 1.31 |
| Sole Korra | 729 | 26377 | 44469 | 18092 | 1.69 |

| Market Price (Rs/kg) | | | | |
|---|---|---|---|---|
| Pigeonpea – 61/- | Greengram - 65/- | Blackgram - 72/- | Cowpea - 60/- | Soybean - 32/- |
| Sorghum - 32/- | Bajra - 26/- | Korra - 23/- | | |

## Conclusion

Among pigeonpea based intercropping systems evaluated Pigeonpea + cowpea (1:5) / Pigeonpea + greengram (1:5) were more productive and profitable than other intercropping systems under rainfed conditions at Krishna district of Andhra Pradesh.

## References


1. Kathmale DK, Dhadge SM, Satpute NR, Patil SV, Ravindra Chary G, Srinivasa Rao Ch *et al*. Evaluation of Pigeonpea (*Cajanus cajan*) based intercropping systems under Semi-arid Vertisol in Scarcity Zone of Maharashtra. Indian journal of Dryland Agricultural Research and Development 2014;29(1):27-34.
2. Mahto DK, Ahmad S, Singh S, Srivastava GP. Soil fertility and nutrient uptake in finger millet (*Eleusine coracana* L.) based Int. J Curr. Microbiol. App. Sci 2018;7(6):2653-2658 2658 intercropping systems. Journal of Research (BAU) 2007;19(1):87-90.
3. Prasad K, Shrivastava RC. Pigeonpea (*Cajanus cajan*) and soyabean (*Glycine max*) intercropping system under rainfed situation. Indian journal agricultural science 2011;61:243-246.
4. Siddique KHM, Johansen C, Turner NC, Jeuffroy MH, Hashem A, Sakar D, *et al*. Innovations in agronomy for food legumes. A review Agronomy for sustainable development 2012;32:45-64.
5. Udhaya ND, Kuzhanthaivel RL. Analysis of light transmission ratio and yield advantages of pigeonpea in relation to intercrop and different plant population. African J. Agric. Res 2015;10(8):731-736.
6. Willey RW. Intercropping, its importance and research needs. Part-1. Competition and yield advantages. Field crops Abstr 1979;32:1-10.