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Effect of Cowpea (*Vigna sinensis* L.) with Maize (*Zea mays* L.) Intercropping on Yield and Its Components

W. A. Hamd Alla, E. M. Shalaby, R. A. Dawood, A. A. Zohry

Abstract**—**A field experiment was carried out at Arab El-Awammer Research Station, Agric. Res. Center. Assiut Governorate during summer seasons of 2013 and 2014. The present study assessed the effect of cowpea with maize intercropping on yield and its components. The experiment comprised of three treatments (sole cowpea, sole maize and cowpea-maize intercrop). The experimental design was a randomized complete block with four replications. Results indicated that intercropped maize plants with cowpea, exhibited greater potentiality and resulted in higher values of most of the studied criteria viz., plant height, number of ears/plant, number of rows/ear, number of grains/row, grains weight/ear, 100–grain weight and straw and grain yields. Fresh and dry forage yields of cowpea were lower in intercropping with maize than sole. Furthermore, the combined of the two seasons revealed that the total Land Equivalent Ratio (LER) between cowpea and maize was 1.65. The Aggressivity (A) maize was 0.45 and cowpea was -0.45. This showed that maize was the dominant crop, whereas cowpea was the dominated. The Competitive Ratio (CR) indicated that maize more competitive than cowpea, maize was 1.75 and cowpea was 0.57. The Actual Yield Loss (AYL) maize was 0.05 and cowpea was -0.40. The Monetary Advantage Index (MAI) was 2360.80.

Keywords**—**Intercropping, cowpea, maize, land equivalent ratio (LER).

I. Introduction

INTERCROPPING is a type of mixed cropping and defined as agricultural practice of cultivating two or more crops in the same space at the same time. The important reason to grow two or more crops together may be increase of productivity per unit of land. In intercropping system, all the environmental resources utilized to maximize crop production per unit area and per unit time. Thus, intercropping systems can provide many benefits through increased efficiency of land use, enhancing the capture and use of light, water and nutrients, controlling weeds, insects, diseases and increasing the length of production cycles. Other benefits of intercropping may be improve quality of the seed, and better control of water quality through minimizing the use of inorganic N fertilizers, replacing them by the use of legumes [1].

W. A. Hamd Alla is with the Crop Intensification Research Department, Field Crops Research Institute, Agriculture Research Centre, Giza, Egypt (phone: +201094290163; fax: +20889230055; e-mail: bwael20@yahoo.com).

A. A. Zohry is with the Crop Intensification Research Department, Field Crops Research Institute, Agriculture Research Centre, Giza, Egypt (e-mail: abdelhafeezzohry@yahoo.com).

E. M. Shalaby and R. A. Dawood are with Department of Agronomy, Fac. of Agriculture, Assiut University, Cairo, Egypt (e- mail: eshalaby55 @yahoo.com, ragabdawood@yahoo.com).

There is a shortage of summer forage crops production in Egypt. Defoliation of maize is commonly used to feed animals. This resulted in decreasing maize yield. Hence, intercropping of forage crops with cereal crops, e.g. maize, sorghum and millet reduce the green fodder gab during summer season.

Maize is ranked third after wheat and rice among the most important cereal crops. In the USA maize is considered the king of cereal crops [2]. In Egypt, maize is essential for human and live-stocks consumption as a major source of carbohydrates, oil, as well as a minor source of protein. It is required for several industrial purposes such as starch and oil. At the same time, cowpea is an important legume crop. It is a primary source of plant protein for humans and animals. Cowpea can be used as a cover crop and to fix nitrogen in the soil [3].

Therefore, the main target of this research was to study the effect of cowpea with maize intercropping on yield and its components. Previous studies indicated that intercropping cowpea with maize significantly increased plant height in both crops and grain yield of maize in the first season and reduced it in the second season, but cowpea yield was reduced in the both seasons [4]. Grain yield of cowpea was reduced by 43% and 33% in intercropping and relay cropping, respectively [5]. Intercropping maize with runner bean (*Phaseolus vulgaris*) gave the highest-equivalent yield productive efficiency, land equivalent ratio, net returns and monetary advantage index [6]. Yield increased in a maize/soybean strip intercropping arrangement were primarily due to the upsurge in the boarder rows of maize together to soybeans [7]. Land equivalent ratio, Aggressivity, Competitive ratio and Actual yield loss were higher, in addition, there was a significant economic benefit expressed with higher Monetary advantage index values have been used to describe competition between component crops of intercropping systems [8]. Maize intercropped with cowpea produced the highest grain yield and the lowest values of associated weeds [9]. Grain yield of maize was observed the highest when maize intercropping with cowpea cultures. In monoculture the yield of cowpea was higher than yield of cowpea, while the lowest yield was obtained when cowpea sown with maize. The highest land equivalent ratio was obtained from corn with cowpea [10]. Maize, sorghum or millet grain yields were increased, or slightly affected by intercropping system compared with the sole crop, but that of legume crop yields (cowpea, bean) showed decrement of 50% [11]. The combined yield from the intercropping system was

higher than the total yielding of any the crops in pure stand. The reduction in intercropped maize yield ranged from 10 to 15% of the pure stand compared with a higher reduction ranging from 45 to 67 % in legume crops (cowpea and bean) pure stand yields [12]. Forage dry weights achieved by the intercrops were greater than those by either maize or cowpea sole crops [13]. Intercropping resulted in an increase in maize plant height especially when the intercropped crops were planted at the same of maize planting date [14]. Yield and of maize either intercropped with legume were the highest as sole crop, moreover, 100% maize + 100% cowpea planting ratio had the highest land equivalent ratio [15]. Intercropping can be used as a tool to improve the competitive ability of a canopy with good suppressive characteristics [16]. Intercropping was advantageous relative to sole cropping as land equivalent ratio values were more than unity [17]. Sorghum plants, when intercropped with cowpea, exhibited greater potentiality and recorded higher values of most of the studied criteria including plant height and grain yield/plant. However, Grain yield per hectare was lower in intercropping pattern than solid pattern [18]. Intercropping also had significantly increased on the maize and cowpea Stover, with intercropping resulting in higher Straw yield compared to the sole crops. The land equivalent ratio also showed that intercropping had a major advantage over sole cropping; particularly, when the maize and cowpea are planted within the same basin [19]. Cowpea intercropped with maize at 1:1 row arrangement recorded the highest grain yield per plant and per hectare, which were significantly different from sole crops [20]. Cowpea yield was lower due to competitive effect of maize in the intercropping system [21]. Maize straw, grain yields and soybean yield were significantly increased by the intercropping [22]. Intercropping cereal and grain legume crops helps maintain and improve soil fertility, because crops such as cowpea, mung bean and soybean accumulate from 80 to 350 kg N/ha. The main advantage of intercropping is the more efficient utilization of the available resources and the increased productivity compared with each sole crop of the mixture [23]. On the other hand, there was decreased yield of maize due to intercropping of legumes namely cowpea [24]. Intercropping may result in decreases in yield of one or both of the individual crops in a mixture. Nevertheless, the productivity of a unit land area is improved by intercropping rather than monocultures [25]. Intercropping maize with cowpea was seen to be significantly decreased the ear length, dry ear weight, dry grain yield and dry total plant biomass [26]. The planting pattern of the maize and legume did not increase the yield of maize [27].

The vegetative biomass legume crops the highest when intercropped with maize [28]. Mixtures of maize-legume showed advantages in land use efficiency expressed as LER [29]. The vegetative growth of component crop in a mixture is affected by intercropping [30]. The highest grain yield was obtained from sole cropping, while the lowest yield was obtained when intercropped maize-cowpea. The land equivalent ratios were higher than one in all intercropping [31]. Maize/bean intercrop system, the bean component did not significantly affect maize grain yield and yield components [32].

II. Materials and Methods

The current study was conducted in research field, Arab El-Awammer Research Station, Agric. Res. Center. Assiut Governorate, Egypt during the summer seasons 2013 and 2014. The field site is located between latitude 27° 05′ and longitude 31° 64′. The soil of such experiment was sandy calcareous as presented in Table I.

TABLE I
Physical -Chemical Properties of the Soil

Chemical soil properties		Mechanical properties	
pH	8.37	Sand (%)	89.9
Ec dsm $^{-1}$	0.33	Clay (%)	3.0
CaCO3 (%)	30.9	Silt (%)	7.1
O.M. (%)	0.19	Class	Sandy
Total N (%)	0.003		
Av. P (ppm)	8.31		
K+	0.75		

O.M: organic matter and Av. P: Available Phosphorus in ppm.
* Agricultural Research Center Soil, Water & Environment Res. Institute Unit of Analysis & Studies

The current study included three treatments namely sole cowpea, sole maize and the intercrop of cowpea with maize, in a randomized complete block design with four replications.

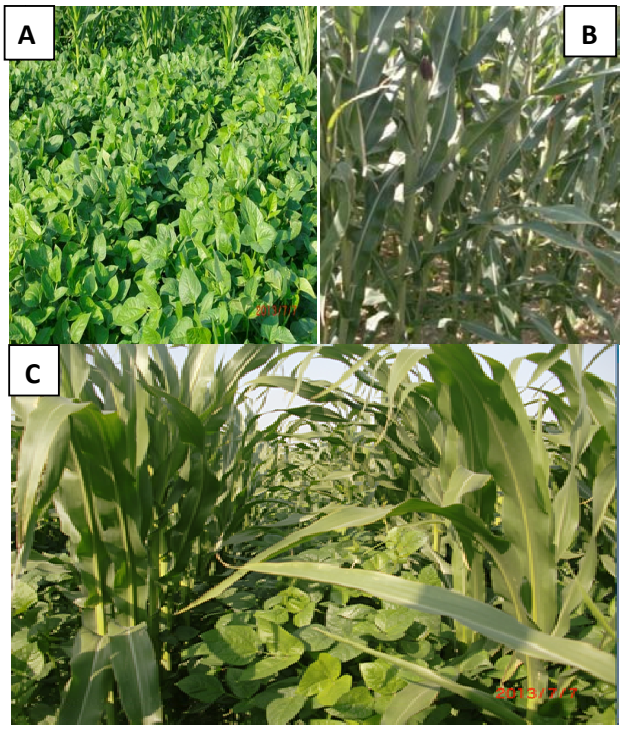

Fig. 1 Cropping systems; (A) Sole cowpea; (B) Sole maize; (C) Intercrop

All other normal cultural practices of growing crops at Assiut Governorate were applied and dates of these practices are present in Table II.

TABLE II
APPLICATION DATES OF SOME CULTURAL PRACTICES OF GROWING CROPS IN THE FIRST AND THE SECOND AT ASSIUT GOVERNORATE

Cultural practices	2013	2014
Sowing of maize and cowpea	12/5/2013	5/5/2014
First cut of cowpea	12/7/2013	5/7/2014
Second cut of cowpea	22/8/2013	15/8/2014
Harvest of maize	2/9/2013	25/8/2014

Each block with sole cowpea, sole maize and cowpea+ maize intercrop was 4.20 m x 5 m (21 m^2). Cowpea seeds variety (cv. Cream) and maize seeds variety (cv. Single cross 130) was sown at 25 cm within a row and 70 cm between rows. Cowpea+ maize intercrops planting both crops on same row (100% cowpea + 100% maize).

The plots were irrigated by sprinkler irrigation. Weeds control and other agricultural practices were performed as recommended.

The fertilization requirements ware calculated based on area of feddan, this is 4200 m^2. The feddan fertilization requirements were 150 kg N fed^{-1}, P_2O_5 (200 kg fed^{-1}) and K_2O (50 kg fed^{-1}). Nitrogen of ammonium nitrate in five equal doses, after 15- 25- 35- 45 and 55 days from sowing for maize. Cowpea was fertilized with 40 kg N fed., ammonium nitrate after thinning.

Studied Traits

A. For Maize

The plants of each plot were harvested at the end of the growing season (110 days from planting) and the ears were separated, air dried for 2 weeks, then total weight of ears/plot and ten plants were chosen at random from each plot at harvest to determine

1- Plant height (cm)
2- Number of ears/plant
3- Ear length (cm)
4- Ear diameter (cm)
5- Number of rows/ear
6- Number of grains/row
7- Grains weight/ear (g)
8- 100–grain weight (g)
9- Grain yield (kg/fed.)
10- Straw yield (kg/fed.)

B. For Cowpea

Two cuts of cowpea were harvested (either sole or intercropping). Traits studied over all cuts

1- Plant height (cm)
2- Number of branches /m^2
3- Fresh forage yield (ton/fed.)
4- Dry forage yield (ton/fed.)

C. Competitive Relationships

1. Land Equivalent Ratio (LER) which verifies the effectiveness of intercropping for using the resources of the environment compared to sole cropping as indicated by [33]. The LER values were calculated as: LER = (LERM + LERC), where LERM = YIM/YM and LERC = YIC/YC, where YM and YC are the yields of maize and cowpea as sole while YIM and YIC are the yields of maize and cowpea as intercrops, respectively.

2. Aggressivity (A) was used to determine the competitive relationship between two crops in a mixture as indicated by [34]. The Aggressivity was calculated as: AM = (YIM/YM x ZIM) – (YIC/YC x ZIC), and AC = (YIC/YC x ZIC) – (YIM/YM x ZIM) where: ZIM = sown proportion of crop maize (in maize intercropping with cowpea); ZIC = sown proportion of crop cowpea (in cowpea intercropping with maize)

3. Competitive Ratio (CR) gives more desirable competitive ability for the crops. The CR represents simply the ratio of individual LERs of the two component crops and takes into account the proportion of the crops on which they are initially sown as indicated by [35] The CR index was calculated using the following formula: CRM = (LERM / LERC) (ZIC / ZIM) while CRC = (LERC / LERM) (ZIM / ZIC).

4. Actual Yield Loss (AYL), which gave more accurate information about the competition than the other indices between components of intercropping system. The AYL is the proportionate yield loss or gain of intercrops compared to sole crop as indicated by [36]. The AYL was calculated as: AYL = AYLM + AYLC, where AYLM = {(YIM/XIM) / (YM /XM)} – 1 and AYLC = {(YIC/XIC) / (YC/XC)} -1, where X is the sown proportion of intercrop maize and cowpea.

5. Monetary Advantage Index (MAI) Suggests that the economic assessment should be terms of the value of land saved; this could probably be most assessed on the basis of the rentable value of this land. The MAI was calculated according to the formula, as indicated by [37].

$$MAI = \frac{\text{Value of combined intercrops x LER - 1}}{\text{LER}}$$

With Egyptian currency (LE), maize Price was 2 LE/kg for grain yield and cowpea was 120 LE/ton for fresh forage yield of the two seasons.

Statistical Analysis

The obtained data in each season were statistically analyzed of a randomized complete blocks design according to procedures outlined as indicated by [38].

III. RESULTS

A. Effect of Cowpea with Maize Intercropping on Maize Characters

Data in Table III revealed that the cowpea with maize intercropping had significantly effect on the plant height and number of ears/plant in both seasons, as well as number of rows/ear and 100-grain weight in the second season only. The other studied traits either in the 1st season or in the 2nd season did not differ significantly affected by the cowpea with maize intercropping. Moreover, the combined intercropping had a highly significantly or significantly effect on the most of the

above studied traits except ear length, number grains/row, grains weight/ear and grain yield/fed. Here, the results indicated that the intercropping significantly increased plant height, number of ears/plant, number of rows/ear, 100-grain weight, ear diameter and straw yield/fed., in the either 1st season and 2nd season and its combined over sole.

TABLE III
EFFECT OF COWPEA WITH MAIZE INTERCROPPING ON THE PLANT HEIGHT, YIELD AND ITS COMPONENTS OF MAIZE IN 2013 AND 2014 SEASONS AND ITS COMBINED

Season 2013										
Characters / Treatments	Plant height (cm)	No. of ears/plant	Ear length (cm)	Ear diameter (cm)	No.of rows/ear	No. of grains/ row	Grains weight/ ear (g)	100-grain weight (g)	Grain yield (kg/fed.)	Straw yield (kg/fed.)
Sole maize	232.64	1.03	19.04	3.92	14.40	39.15	122.20	31.05	2246	2636
Intercropping cowpea + maize	235.47	1.05	19.70	4.03	15.00	40.85	140.40	32.20	2340	2721
F-test	**	*	NS	NS	NS	NS	NS	NS	NS	NS
Season 2014										
Characters / Treatments	Plant height (cm)	No. of ears/plant	Ear length (cm)	Ear diameter (cm)	No.of rows/ear	No. of grains/ row	Grains weight/ ear (g)	100-grain weight (g)	Grain yield (kg/fed.)	Straw yield (kg/fed.)
Sole maize	229.63	1.09	19.91	4.23	15.00	41.22	138.12	33.43	2420	2926
Intercropping cowpea + maize	233.98	1.10	20.36	4.41	15.60	42.62	155.99	35.07	2550	3004
F-test	**	**	NS	NS	**	NS	NS	*	NS	NS
Combined of the two seasons										
Characters / Treatments	Plant height (cm)	No. of ears/plant	Ear length (cm)	Ear diameter (cm)	No.of rows/ear	No. of grains/ row	Grains weight/ ear (g)	100-grain weight (g)	Grain yield (kg/fed.)	Straw yield (kg/fed.)
Sole maize	231.14	1.06	19.47	3.98	14.70	40.18	130.16	32.24	2333	3706
Intercropping cowpea + maize	234.73	1.08	20.03	4.21	15.30	41.73	148.19	33.64	2445	3834
F-test	**	**	NS	*	**	NS	NS	**	NS	*

*, **: indicated the significantly and highly significantly at 0.05 and 0.01 levels of probability, respectively
NS: non-significant difference

B. Effect of Cowpea with Maize Intercropping on Cowpea Characters

Data in Table IV showed that the plant height and number of branches/plant had a highly significantly affected by the intercropping either in the 1st cut or in the 2nd cut in both seasons. Moreover, the fresh forage yield and dry forage yield had significantly either in the 1st cut or in the 2nd cut in the both seasons. The results indicated that the cowpea plant height (cm) surpassed in the intercropping either in the 1st cut or in the 2nd cut over the sole cowpea in both seasons. However, the cowpeas number of branches/plant, fresh forage yield and dry forage yield (ton/ fed.) surpassed in either 1st cut or in the 2nd cut over the cowpea with maize intercropping in both seasons.

C. Effect of Cowpea with Maize Intercropping on Competitive Relationships and Yield Advantages in 2013 and 2014 Seasons and Its Combined

1. Land Equivalent Ratio (LER)

Results in Table V showed that LER values were greater (1.59, 1.70 and 1.65) than one in the both seasons and the combined analysis. The results, also showed that maize was superior in the intercrop system where the relative yield was increased (1.04, 1.05 and 1.05) of the sole in the both seasons and the combined analysis. Cowpea was inferior companion crop where the relative yield was decreased (0.55. 0.65 and 0.60) of the sole in the both seasons.

2. Aggressivity (A)

The data of Aggressivity revealed that values of (A) of maize was (0.49, 0.40 and 0.45) of the sole in both seasons and the combined analysis. Cowpea was (-0.49, -0.40 and -0.45) of the sole in the both seasons and the combined analysis.

3. Competitive Ratio (CR)

The CR of maize was greater (1.89, 1.61 and 1.75) while the CR of cowpea which was less than one (0.52, 0.62 and 0.57).

4. Actual Yield Loss (AYL)

The AYL values of maize were positive, (+0.04, +0.05 and +0.05) indicating that there was increase in yield (4.0, 5.0 and 5.0%) when intercropping with cowpea in both seasons and the combined seasons were analyzed. Actual Yield Loss values of cowpea were negative (-0.45, -0.35 and -0.40) indicating that there was a decrease in yield (45, 35 and 40% of sole).

5. Monetary Advantage Index (MAI)

The *MAI* is an indicator of the economic feasibility of intercropping systems. These values of MAI were 2097.28, 2607.95 and 2360.80 in both seasons and the combined analyses.

TABLE IV
EFFECT OF COWPEA WITH MAIZE INTERCROPPING ON PLANT HEIGHT, NUMBER OF BRANCHES/PLANT, FRESH FORAGE YIELD AND DRY FORAGE YIELD OF COWPEA 2013 AND 2014 SEASONS

Traits / Treatments	Season 2013						Season 2014					
	First cut		Second cut		Mean cuts		First cut		Second cut		Mean cuts	
	Plant height (cm)	No. of branches/ plant	Plant height (cm)	No. of branches/ plant	Plant height (cm)	No. of branches/ plant	Plant height (cm)	No. of branches/ plant	Plant height (cm)	No. of branches/ Plant	Plant height (cm)	No. of branches/ plant
Sole cowpea	83.75	5.42	76.33	3.31	80.04	4.37	78.52	5.45	71.48	3.66	75.00	4.56
Intercropping cowpea + maize	127.68	2.75	96.51	1.53	112.10	2.14	106.96	2.90	92.78	1.94	99.87	2.42
F-test	**	**	**	**	**	**	**	**	**	**	**	**
	First cut		Second cut		Total cut		First cut		Second cut		Total cut	
Traits / Treatments	Fresh forage yield (ton/fed.)	Dry forage yield (ton/fed.)	Fresh forage yield (ton/fed.)	Dry forage yield (ton/fed.)	Fresh forage yield (ton/fed.)	Dry forage yield (ton/fed.)	Fresh forage yield (ton/fed.)	Dry forage yield (ton/fed.)	Fresh forage yield (ton/fed.)	Dry forage yield (ton/fed.)	Fresh forage yield (ton/fed.)	Dry forage yield (ton/fed.)
Sole cowpea	9.37	1.81	5.27	1.16	14.64	2.97	10.33	2.21	5.57	1.34	15.90	3.56
Intercropping cowpea + maize	5.69	1.13	2.41	0.60	8.10	1.72	7.12	1.54	3.17	0.80	10.28	2.34
F-test	*	*	*	*	*	*	*	**	**	**	**	**

*, **: indicated the significantly and highly significantly at 0.05 and 0.01 levels of probability, respectively
NS: non-significant difference

TABLE V
EFFECT OF COWPEA WITH MAIZE INTERCROPPING ON COMPETITIVE RELATIONSHIPS AND YIELD ADVANTAGES IN 2013 AND 2014 SEASONS AND ITS COMBINED

Characters / Treatments	Yield/fed.		Land Equivalent Ratio (LER)			Aggressivity (A)		Competitive Ratio (CR)		Actual Yield Loss (AYL)			Monetary Advantage Index (MAI)
	maize kg/fed.	cowpea ton/fed.	LERM	LERC	total	AM	AC	CRM	CRC	AYLM	AYLC	total	
Season 2013													
Sole	2246	14.64											
Intercropping cowpea + maize	2340	8.10	1.04	0.55	1.59	0.49	-0.49	1.89	0.52	0.04	-0.45	-0.41	2097.28
Season 2014													
Sole	2420	15.90											
Intercropping cowpea + maize	2550	10.28	1.05	0.65	1.70	0.40	-0.40	1.61	0.62	0.05	-0.35	-0.30	2607.95
Combined of the two seasons													
Sole	2333	15.27											
Intercropping cowpea + maize	2445	9.19	1.05	0.60	1.65	0.45	-0.45	1.75	0.57	0.05	-0.40	-0.35	2360.80

IV. DISCUSSION

The height of maize plant under intercropping system was more than that in the sole maize may be due to competition of associated crops for intercepted the light intensity, Therefore, its lead to the increase in maize plant. Moreover, the highest grain yield of intercropped maize may be due to the highest values for number of ears/plant, ear length, number of rows/ear, number of grains/row and 100-grain weight, since an important yield components caused in increasing the grain yield/fed at compared the sole maize. Moreover, cowpea plantation in such agro-ecosystem can be played as a reservoir for the naturally occurring biological control agents (As in Fig. 2). Intercropping is the best cropping system, because at this system light interception, soil moisture, soil temperature and yield were higher compared to sole crops. Microclimatic variation in intercropping system have caused favorable environmental conditions, ready for growth and high yield compared to sole crops [15]. Also, [18] mentioned that sorghum intercropped with cowpea exhibited greater potentiality and recorded higher values of plant height and grain yield/plant. However, Grain yield per hectare was lower in intercropping pattern than solid pattern. Moreover, [23] found that intercropping cereal and grain legume crops helps maintain and improve soil fertility, because crops such as cowpea, mung bean and soybean accumulate from 80 to 350 kg N/ha. The main advantage of intercropping is the more efficient utilization of the available resources and the increased productivity compared with each sole crop of the mixture. These results are conformity to those reported by [4], [7], [9], [11], [14], [16], [19], [20]. They mentioned that cowpea intercropped with maize at 1:1 row arrangement recorded the highest grain yield per plant and per hectare, which were significantly different from sole crops. However, [27], [32] found that in a maize/bean intercrop system the bean component does not significantly affect maize grain yield and yield components. On the other hand, [24], [26] reported that intercropping maize with cowpea was seen to significantly decrease ear length, dry ear weight and dry grain yield at the same of maize planting date.

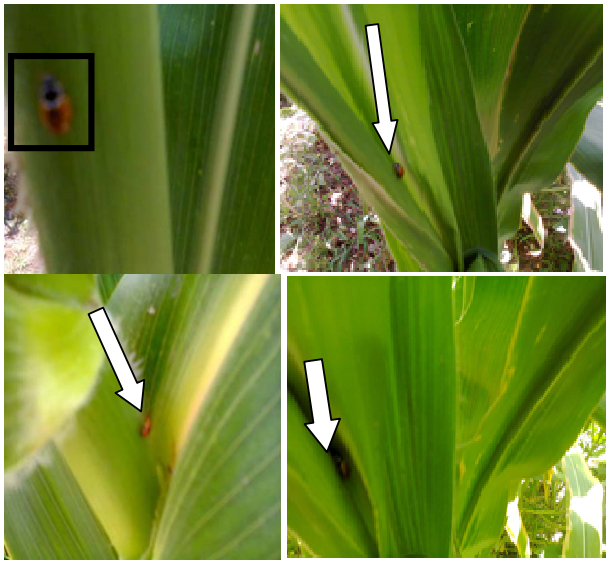

Fig. 2 Spotted ladybird on maize plants intercropped with cowpea

The cowpea plant height was higher in intercrop than that in sole cowpea. This finding is logic, since the light competition inter-and intra-plants of cowpea and the maize under intercropping. It is clear that the competition between the two-associated crops amplified by maize elongation and consequently its large shading on cowpea. In addition, the reduction in green forage yield was higher in the second cut than in the first cut compared with solid plant in both seasons. The large reduction in the second cut due to the highest competition of maize with shading effect of the taller component maize, which obstructed solar radiation from penetrating into the lower cowpea canopy, the lowest shading of young maize plants on cowpea accompanies with the lowest competitions and in consequence lowest forage yield reduction. The maximum growth and yield of cowpea was observed in single cropping. They added that the stem dry weight reduced by 52% in intercropping as compared to single cropping [5]. These results are consistent with those obtained by [11], [12], [21]. On the other hand, [13] mentioned that forage dry weights achieved by the intercrops were greater than those by either maize or cowpea sole crops. Also, [22] reported that the highest straw yield was obtained under the sole crop at compared by the intercropping crops. Similar results were also reported by [19], [28], [30].

Data in Table V indicated that LER, A, CR, AYL and MAI varied considerably due to the effect of intercropping cowpea on maize. The LER it could be concluded that actual productivity was higher the expected productivity. Aggressivity revealed that values of maize were positive, whereas it was negative for cowpea. It showed that maize was the dominant crop and cowpea was the dominated crop in the both seasons and the combined analyses. The CR indicated that the maize was dominant crop and more competitive than cowpea. Similar trend to that of LER, A and CR was also observed for AYL in Table V. In particular, AYL for maize was positive value in both seasons and the combined analysis. When intercropping with cowpea, which indicates a yield advantage for maize probably because of the positive effect of cowpea on maize when grown in association. While AYL values of cowpea was negative when intercropping on maize, which indicated a yield advantage. These values of MAI were positive due to LER and CR was greater than one. Similar resulted were observed by [6], [8], [10], [14], [15], [17], [19], [29], [31].

V. Conclusion

In conclusion, the productivity of a unit land area is improved by intercropping rather than monocultures. Intercropping can be used as a tool to improve competitive ability of a canopy with good suppressive characteristics. Results indicated that cowpea with maize intercrop produced greater grain yield than maize sole crop. The LER also showed that intercropping had a major advantage over sole cropping particularly when the maize and cowpea were planted within the same basin. We recommend that planting of cowpea with maize mixture should be 100% cowpea: 100% maize (cowpea intercrop on the other side of maize rows).

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