CONTENTS

5. SUMMARY

Two field experiments were conducted in 2003 and 2004 seasons in the farm of Sers El-Lian Agricultural research Station, A.R.C. Minufiya Governorate, A.R.E. to evaluate three maize varieties i.e. (S.C.10, T.W.C. 321 and Giza 2 under three levels of nitrogen fertilizer (100, 120 and 140 kg N/fed.) and intercropping maize with mungbean at different patterns (2 : 1, 2 : 2 and 2 :3) and their effect on growth, yield and its components as well as competitive relationships of the two crops.

The soil type was clay with pH 8.1 and 7.40 in the first and second seasons, respectively.

Each experiment included 31 treatments which were the combination of three maize varieties, three levels of nitrogen fertilizer and three patterns of intercropping as well as three treatments of pure stand for maize varieties and one treatment of pure stand for mungbean, Kawmy 1, variety (*Vigna radiate* L. wilezelk). The experimental design was split- split plots with four replications. Maize was grown on both sides of the ridges (140 cm), 30 cm between hills with three patterns intercropping of mungbean (one row, two rows and three rows on the ridge), 20 cm between hills and two plants per hill. Mungbean was sown on May 24 and 20 in 2003 and 2004 seasons, respectively. While maize varieties were sown at 7 and 3 June in the first and second seasons, respectively.

The studied characteristics were as follow :

I. Maize :

1- **Growth characters:** plant height, ear position, stem diameter, number of green leaves/plant, leaf area of the topmost ear and time of tasseling and silking.

2- **Yield abd yield components:** percentage of double –eared plants, ear length, ear diameter, number of rows/ear, number of grains/row, ear weight, weight of grains/ear, shelling percentage, weight of 100-grains and grain yield/feddan.

3- **Chemical analysis :** protein content, oil content and carbohydrate content in maize grains.

II. Mungbean :

1- **Growth characters:** plant height, number of branches/plant, number of leaves/plant and leaf area index.

2- **Yield and yield components:** number of pods and seeds/plant, weight of pods and seeds/plant, weight of 100-seeds and seed yield/feddan .

3- **Chemical analysis :** protein content, oil content and carbohydrate content in mungbean seeds.

III. Competitive relationships and yield advantage :

Land equivalent ration, relative crowding coefficient and aggressivity.

The most important results can be summarized as follows :

I. Maize crop :

1. Growth characters :

1.1. Maize varietal differences :

1.1.1. S.C. 10 variety was the tallest plant and highest ear position followed T.W.C. 321 and Giza varieties in both seasons.

1.1.2. T.W.C. 321 variety surpassed the other varieties in stem diameter, number of green leaves/plant and leaf area of the topmost ear.

1.1.3. Giza 2 variety was the earlist variety in tasseling and silking dates, S.C. 10 variety ranked the second, while T.W.C. 321 variety gave the latest variety.

1.2. Effect of nitrogen level :

1.2.1. Nitrogen fertilization showed highly significant effect on all growth characters of maize plant under study in both seasons.

1.2.2. The application of 140 Kg N/feddan gave the tallest plant, highest ear position, stem diameter, number of green leaves/plant and leaf area of the topmost ear.

1.2.3. The number of days to 50% tasseling and silking were significantly increased by increasing N level up to 140 kg N/feddan.

1.3. Effect of intercropping patterns :

1.3.1. Intercropping patterns had a significant effect on maize plant height, ear position and stem diameter, the highest values were obtained when intercropping maize plants with mungbean plants in (2 :1) pattern.

1.3.2. the effect of intercropping patterns on number of green leaves/plant and time of tasseling were significant in both seasons. Number of green leaves/plant reaches the highest value when maize plants were intercropped with mungbean under (2 :1) pattern. Whereas, intercropping patterns (2 :2) and (2 :3) delayed tasseling and silking as compared with pattern (2 :1).

1.3.3. The mean values of ear leaf area did not varied significantly among all studied intercropping patterns in both seasons.

1.4. interaction effects :

1.4.1. The interaction between maize varieties and N-level was significant affected on plant height and stem diameter in both seasons, number of green leaves/plant, time of tasseling and silking in one season out of two. S.C. 10 or T.W.C. 321 maize varieties with applied 140 kg N/feddan gave the tallest plant and maximum mean values of stem diameter and number of green leaves per plant. Whereas Giza 2 variety with adding 100 kg N/feddan gave the earliest tasseling and silking dates.

1.4.2. The average values of plant height, stem diameter, time of tasseling and silking and ear leaf area were significantly affected by the interaction between maize varieties and intercropping patterns. T. W. C. 321 variety when intercropped with mungbean in (2 :1) pattern gave the tallest plant and maximum stem diameter, whereas S.C. 10 variety under 2 : 1 pattern gave the highest area of ear leaf. The number of days to 50% tasseling and silking were earlier with Giza 2 variety under (2 : 1) pattern.

1.4.3. The effect of the interaction between N-level and intercropping patterns was not significant on all growth characters of maize under study in both seasons .

1.4.4. The interaction between maize varieties, N-levels and intercropping patterns did not affect significantly all characters of maize growth under study except plant height in both seasons and ear height in the second season. S.C. 10 or T.W.C. 321 maize varieties with applied 140 kg N/feddan when intercropped with mungbean in 2 :1 pattern gave the tallest plant and highest ear position.

2. Yield and yield components :

2.1. Maize varietal differences :

2.1.1. T.W.C. 321 variety gave the maximum mean values of double eared percentage/plant and highest ear length, ear weight and grain weight/ear, whereas no significant difference was obtained between S. C. 10 and T.W.C. 321 varieties in the percentage of double eared/plant, number of rows/ear, number of grains/row, ear weight and weight of grains/ear.

2.1.2. S.C. 10 variety surpassed significantly the other maize varieties in ear diameter, number of rows/ear, number of grains per row, shelling percentage, 100-grain weight and grain yield/feddan.

2.2. Effect of nitrogen level:

2.2.1. Nitrogen application up to 140 kg N/feddan caused a significant increase in the percentage of double eared plants and ear characters, 100-grian weight and grain yield/feddan.

2.2.2. Nitrogen application had no significant effect on shelling percentage in both seasons.

2.3. Effect of intercropping patterns :

2.3.1. Intercropping pattern 2 : 1 significantly surpassed the other patterns in percentage of double eared plants, ear characters, 100-grain weight and grain yield/feddan.

2.3.2. Shelling percentage was slightly increased by intercropping maize with mungbean in 2 : 2 pattern in both seasons without significant differences among the other intercropping patterns.

2.4. Interaction effects :

2.4.1. The effect of the interaction among maize varieties and N-level was significant on percentage of double eared per plant and ear length in one season only as well as ear weight, weight of grains/ear and 100-grain weight in both seasons. S.C. 10 or T.W.C.321 varieties with applied 140 kg N/feddan gave the highest values of double eared percentage per plant, ear length, ear weight, weight of grains/ear and 100-grain weight.

2.4.2. The mean values of ear diameter, number of rows/ear and number of grains/row in one season out of two as well as ear weight and weight of grains/ear in both seasons were significantly affected by the interaction between maize varieties and intercropping patterns. Maximum number of rows/ear, ear weight and weight of grains/ear in the first season were obtained from T.W.C. 321 under 2 : 1 pattern, whereas S.C. 10 variety when intercropping in 2 : 1 pattern produced the highest mean values of number of grains/row, ear weight and weight of grains/ear in the second seasons. Also, S.C. 10 variety under 2 : 2 pattern gave the maximum mean values of ear diameter in the first season.

2.4.3. The interaction between N-level and intercropping patterns was significant affected on the percentage of double eared/plant, ear weight and grain weight/ear in one season out of two as well as number of grains/row in both seasons. The highest percentage of double eared/ plant and number of grains/ row were obtained by adding 140 kg N/feddan with intercropping

in 2 : 1 pattern, whereas, when increasing plant density of mungbean in pattern 2 : 3 with applied 140 Kg N/feddan gave the maximum weight of ear and weight of grains/ear.

2.4.4. There was a significant difference on number of grains/row, ear weight, weight of grains/ear and grain yield/feddan due to the interaction between the three factors in one seasons out of two. S.C. 10 variety with added 140 kg N/feddan when intercropped with mungbean under 2 :3 pattern gave the highest values of grains number/row and greatest grain yield/feddan. Whereas the maximum ear weight and grain weight/ear were produced from T.W.C. 321 variety with applied 140 kg N/feddan when intercropped with mungbean under (2 :3) pattern.

3. Chemical analysis :

3.1. Maize varietal differences :

The differences among maize varieties in protein, oil and carbohydrate contents were not significant.

3.2. Effect of nitrogen level :

There was a significant difference in protein and carbohydrate contents due to application of nitrogen fertilizer in one season out of two, whereas oil content was not significantly affected by increasing N-level from 100 to 140 kg N/feddan in both seasons. Application of 140 kg N/feddan gave the maximum content of protein and minimum content of carbohydrate in grains .

3.3. Effect of intercropping patterns:

Intercropping patterns had a significant effect on protein and carbohydrate contents in both seasons and oil content in the first season only. The maximum content of protein and carbohydrate and the minimum oil content were produced from increasing plant density of mungbean plant in pattern 2 : 3.

3.4. Interaction effects :

3.4.1. There was a significant difference on protein and carbohydrate content in maize grains in the second season due to the interaction between maize varieties and N- level. T.W.C. 321 variety with adding 100 kg N/feddan gave the highest protein content. While S.C.10 variety with applied 100 kg N/feddan gave the maximum content of carbohydrate.

3.4.2. The effect of the interaction between maize varieties and intercropping patterns were not significant on all characters of chemical analysis under study in both seasons.

3.4.3. The mean values of oil content and carbohydrate content were significantly affected by the interaction between N-level and intercropping patterns in one season only. The highest content of oil produced from adding 120 kg N/feddan when intercropping maize with mungbean in 2 : 1 pattern, whereas when increasing plant density of mungbean in 2:3 pattern with adding 120 kg N/feddan gave the highest carbohydrate content in maize grains.

3.4.4. The interaction between the three factors on protein and oil content in one season out of two and carbohydrate content in both seasons were significant. T.W.C. 321 variety surpassed the other varieties with adding 120 kg N/feddan under 2:3 pattern in protein, carbohydrate and oil content in maize grain.

II. Mungbean crop :

1. Growth characters :

1.1. Maize varietal differences :

1.1.1. Intercropping S.C. 10 maize variety with mungbean plants recorded the highest values of plant height of mungbean and number of branches/plant, whereas mungbean planted under T.W.C. 321 variety surpassed that plants under S.C. 10 or Giza 2 varieties in number of leaves/plant.

1.1.2. Insignificant variation among the three tested maize varieties in leaf area index of mungbean .

1.2. Effect of nitrogen levels :

1.2.1. Plant height, number of branches/plant and number of leaves/plant of mungbean were significantly increased by increasing N-level from 100 to 140 kg N/feddan in both seasons.

1.2.2. The differences between the mean values of leaf area index were not significant due to increasing N-level up to 140 N/feddan in both seasons.

1.3. Effect of intercropping patterns :

1.3.1. Intercropping patterns had a significant effect on [plant height, number of branches/plant and number of leaves/plant in both seasons. The tallest plant of mungbean and highest number of branches/plant and number of leaves/plant produced when 2:1 pattern was applied as compared with the other patterns.

1.3.2. Leaf area index of mungbean was significantly influenced by the intercropping pattern in one season out of two. The intercropping pattern of 2 :1 increased LAI compared with the other patterns .

1.4. Interaction effects :

1.4.1. The effect of the interaction between maize varieties and N-level was significant in plant height, number of branches/plant, number of leaves/plant and leaf area index in one season only. S.C.10 maize variety with applied 140 kg N/feddan gave the tallest plant and maximum number of branches/plant. T.W.C. 321 variety with applied 140 kg N/feddan gave the highest number of leaves/plant, whereas, the greatest leaf area index was produced from Giza 2 variety with adding 140 kg N/feddan.

1.4.2. There was a significant difference on number of branches/plant in both season and leaf area index in the first season due to the interaction between maize varieties and intercropping patterns. The highest number of branches/plant was produced from intercropping S.C. 10 variety under 2 :

1 pattern. On the other hand, Giza 2 variety under pattern 2 : 1 gave the maximum leaf area index.

1.4.3. The effect of the interaction between N-level and intercropping pattern was significant on plant height and number of leaves/plant in both seasons. The tallest plants and maximum number of leaves/plant were obtained from intercropping maize with mungbean under 2 : 1 pattern with application of 140 kg N/feddan.

1.4.4. The interaction between the three factors did not affect significantly all characters of mungbean growth in both season except plant height was significantly affected by the interaction between the three factors in the second season only. The tallest plants were produced from intercropping S.C. 10 or T.W.C. 321 varieties with mungbean and applied 140 kg N/feddan under 2 :1 pattern. While intercropping Giza 2 variety with mungbean under 2 : 3pattern with added 100 kg N/feddan gave the shortest plant.

2. Yield and yield components :

2.1. Maize varietal differences :

2.1.1. Maize varieties had a significant effects on number of pods and seeds/plant and weight of seeds/plant in both season as well as weight of pods/plant and seed yield of mungbean in one season out of two. Mungbean plants when grown with T.W.C. 321 maize variety gave the highest number of pods and seeds/plant and maximum weight of pods and seeds/plant.

2.1.2. Mungbean plants intercropped with S.C. 10 maize variety exceeded the other maize varieties in seed yield of mungbean/feddan.

2.2. Effect of nitrogen level :

2.2.1. Number of pods and seeds/plant, weight of pods and seeds/plant, 100-seed weight and seed yield of mungbean/feddan were significantly increased by increasing N-level from 100 to 120 up to140 kg N/feddan in both seasons.

2.2.2. The increase in N-level from 100 to 120 and 140 kg N/feddan increased seed yield of mungbean by 14.67 and 26.78%, respectively in the first season, the corresponding increases were 7.58 and 18.67%, respectively in the second season.

2.3. Effect of intercropping patterns :

2.3.1. Intercropping pattern of 2:1 surpassed significantly the other patterns in number of pods and seeds/plant, weight of pods and seed/plant and 100-seed weight in the two seasons.

2.3.2. Seed yield of mungbean/feddan was significantly affected by intercropping patterns in both seasons. Intercropping pattern of 2 : 3 gave the maximum seed yield/feddan. The increases were 34.56 and 15.43% in the first season over those grown in 2 : 1 and 2 : 2 pattern, respectively. The corresponding increases in seed yield/feddan were 47.68 and 16.79%, respectively in the second season .

2.4. Interaction effects :

2.4.1. The effect of the interaction among maize varieties and N-level was significant on number of pods and seeds/plant, 100-seed weight and seed yield of mungbean per feddan in both seasons. The highest values of pods and seeds number /plant produced from intercropping mungbean with T.W.C. 321 mazie variety and applied 140 kg N/feddan. While, S.C. 10 variety with intercropping mungbean plants with adding 140 kg N/feddan gave the maximum weight of 100-seed and greatest seed yield/feddan.

2.4.2. The mean values of pods and seeds number /plant, weight of pods and seeds/plant and 100-seeds weight in the first season and seed yield/feddan in the second season were significantly affected by the interaction between

maize varieties and intercropping patterns. Maximum number of pods and seeds/plant in the first season were obtained from T.W.C. maize variety under 2 :1 pattern, whereas, S.C.10 maize variety when intercropped mungbean plant in 2 : 1 pattern produced the highest weight of pods/plant and weight of 100-seed in the first season. On the other hand, intercropping S.C. 10 maize variety with mungbean plants in 2 : 3 pattern gave the greatest seed yield of mungbean /feddan in the second season.

2.4.3. There was a significant difference on number of pods and seeds/plant, weight of pods and seeds/plant in one season out of two as well as 100-seed weight and seed yield of mungbean/feddan in both seasons due to the interaction between N-level and intercropping patterns. Intercropping maize plants with mungbean plants under 2 : 1 pattern with increasing N-level up to 140 Kg N/feddan gave the maximum number of pods and seeds/plant, weight of pods and seeds/plant and 100-seed weight. Whereas, when increasing plant density of mungbean in pattern (2 :3) with applied 140 kg N/fed. gave the greatest seed yield of mungbean/feddan.

2.4.4. The interaction between three factors had significant effect on number of pods/plant, weight of pods/plant in both seasons, number of seeds/plant, seed weight/ plant and 100-seed weight in the second season only. Maize variety of T.W.C. 321 with added 140 kg N/feddan when intercropped with mungbean under 2 : 1 pattern gave the highest number of pods/plant and weight of pods/ plant and maximum number of seeds/plant and seed weight/plant. Intercropping S.C. 10 maize variety with increasing N-level up to 140 kg N/feddan and increasing plant density of mungbean plants in 2 : 3 pattern gave the greatest seed yield of mungbean/feddan.

3. Chemical analysis:

3.1. Maize varietal differences:

3.1.1. T.W.C. 321 maize variety surpassed significantly the other maize varieties in protein content in the first season and oil content in second season. Whereas, Giza 2 maize variety gave the highest significantly in carbohydrate content in the first season.

3.2. Effect of nitrogen levels:

3.2.1. There was a significant effect on protein, oil and carbohydrate content in seed of mungbean due to nitrogen fertilizer levels in both seasons.

3.2.2. The maximum value of protein content was 31.86 and 30.91% produced from application of 140 Kg N/feddan in the first and second seasons, respectively.

3.2.3. Oil and carbohydrate content in seeds of mungbean gave the maximum with application 100 Kg N/feddan in both seasons.

3.3. Effect of intercropping patterns:

3.3.1. The effect of intercropping patterns had a significant on protein, oil and carbohydrate contents in seed of mungbean in both seasons.

3.3.2. Intercropping pattern under 2:1 gave the maximum mean values of protein content in both season and oil content in the first season. While 2:2 pattern gave the maximum content of carbohydrate in both seasons.

3.4. Interaction effects:

3.4.1. There was a significant difference on protein, oil and carbohydrate contents in seed of mungbean in both seasons as affected by the interaction between maize varieties and N-level. T.W.C. 321 and S.C. 10 maize varieties with adding 140 Kg N/feddan gave the highest content of protein in the first and second seasons, respectively. Whereas, Giza 2 maize variety with applied 100 Kg N/feddan gave the greatest mean value of oil content in the first season and carbohydrate content in both seasons.

3.4.2. The effect of the interaction between maize varieties and intercropping patterns were significant on all characters of chemical analysis of mungbean seeds under study in both seasons. The maximum content of protein, oil and carbohydrate were produced from different maize varieties under intercropping in 2:2 pattern.

3.4.3. The maximum content of protein was produced from mungbean plants grown in 2:1 pattern with adding 140 Kg N/feddan in both seasons. Whereas, application of 140 and 100 Kg N/feddan with intercropping in 2:1 pattern gave the highest oil content in the first and second seasons, respectively. Also, the maximum content of carbohydrate was produced from application 100 and 120 Kg N/feddan under 2:1 pattern in the first and second seasons, respectively.

3.4.4. The mean values of protein, oil and carbohydrate content were significantly affected by the interaction between the three factors under study in both seasons.

III. Competitive relationships and yield advantages :

1. Maize varietal differences :

1.1. Land equivalent ratio (LER) :

1.1.1. The best results were obtained by intercropping mungbean with T.W.C. 321 followed by with Giza 2 and S.C. 10 varieties .

1.1.2. Maize varieties with mungbean produced higher yields than the expected where Lz and Lm exceeded 0.50.

1.2. Relative crowding coefficient (RCC):

1.2.1. The best results was achieved by intercropping mungbean with T.W.C. 321 maize variety in both seasons.

1.2.2. Maize varieties coefficient (Kz) exceeded than mungbean coefficient (Km).

1.3. Aggressivity (A):

1.3.1. Aggressivity values were higher recorded when S.C. 10 and T.W.C. 321 maize varieties intercropped with mungbean in the first and second seasons, respectively.

13.2. Maize varieties of S.C.10 and T.W.C. 321 in the first and second seasons, respectively are excellent competitive in intercropping combination due to its high competitive ability.

2. Effect of nitrogen level :

2.1. Land equivalent ratio LER :

2.1.1. LER values increased consistently with increasing N-level up to 140 kg N/feddan in both seasons. The application of 100, 120 and 140 kg N/feddan increased land equivalent ratio by 31, 34 and 44%, respectively in the first season, the corresponding increases were 22, 35 and 42%, respectively in the second season.

2.1.2. LZ was more contributor for LER than LM when increasing N level from 100 to 120 and 140 kg N/feddan.

2.2. Relative crowding coefficient (RCC):

2.2.1. The best results were 9.63 and 9.11, obtained from applied 140 kg N/feddan in the first and second seasons, respectively.

2.2.2. Maize coefficient (KZ) was higher than mungbean coefficient (Km) in all fertilizer levels.

2.3. Aggresivity (A):

2.3.1. Aggressivity values of maize were always positive in the three levels of nitrogen fertilizer and those of mungbean were negative in both seasons.

2.3.2. Aggressivity values were decreased with increasing N-level in the first season, while increasing N level caused a little increase in A value in the second season.

3. Effect of intercropping patterns :

3.1. Land equivalent ratio (LER):

3.1.1. The values of LER of maize were higher than those of mungbean over all intercropping patterns in both seasons.

3.1.2. Intercropping patterns 2 : 1, 2 : 2 and 2 : 3 were increased productivity by 29, 39 and 44% in the first season and 30, 33 and 40% in the second season, respectively.

3.2. Relative crowding coefficient (RCC):

3.2.1. The best results were realized with intercropping maize and mungbean at 2 : 3 pattern followed by 2 : 2 and 2 : 1 gave the lowest values in both seasons.

3. 2. 2. Maize was the better component in all intercropping patterns with higher Km values in both seasons.

3.3. Aggressivity (A):

3.3.1. Aggressivity values were positive for maize intercropped with mungbean in all intercropping patterns, while mungbean had negative values.

3.3.2. Maize was the dominant and mungbean was the dominated one in all intercropping patterns under study.

4. Interaction effects :

4.1. Effect of the interaction between maize varieties and N-levels :

4.1.1. Land equivalent ratio (LER) :

4.1.1.1. LER exceeded one in all combination between maize varieties and N-levels in both seasons.

4.1.1.2. Lz was better contributer in LER than Lm in T.W.C. 321 maize variety with different N-levels.

4.1.1.3. The highest values of LER was recorded when adding 140 kg N/feddan with T.W.C. 321 variety.

4.1.2. Relative crowding coefficient (RCC):

4.1.2.1. T.W.C. 321 maize variety with adding 140 kg N/feddan gave the best RCC value in both seasons.

4.1.2.2. In all interaction between maize varieties x N-level Kz has more competitive abilities than Km in both seasons.

4.1.3. Aggressivity (A):

4.1.3.1. Maize was the dominant component in all interaction between maize varieties and N-level in both seasons.

4.1.3.2. Aggressivity values were positive in all Az and opposite its were negative in all Am values.

4.2. Effect of the interaction between maize varieties and intercropping patterns :

4.2.1. Land equivalent ratio (LER) :

4.2.1.1. The highest LER values were associated with T.W.C. 321 when intercropping with mungbean under 2 :3 pattern .

4.2.1.2. Maize was better contributer in land equivalent ratio with intercropping different maize varieties under different intercropping patterns .

4.2.1.3. With regard to mungbean, Giza 2 maize variety under 2 : 1 pattern in the first season and three maize varieties under 2 : 1 pattern in the second season, Lm was not reached to 50% of its pure stand.

4.2.2.Relative crowding coefficient (RCC):

4.2.2.1. The highest values of relative crowding coefficient was 9 and 8.35 produced from T.W.C. 321 under intercropping 2 : 3 pattern in the first and second seasons, respectively.

4.2.2.2. KZ was increased with increasing plant dnsity of mungbean plant with the three tested maize varieties, whereas Km as decreased .

4.2.3. Aggressivity (A):

4.2.3.1. Aggressivity increased with T.W.V. 321 maize variety under 2 : 3 pattern in both seasons.

4.2.3.2. Maize in all cases with the dominant components, while mungbean was the dominated.

4.3.Effect of the interaction between N-level and intercropping patterns:

4.3.1. Land equivalent ratio (LER):

4.3.1.1. The best results was achieved at 2 : 3 intercropping pattern and 140 kg N/feddan in both seasons .

4.3.1.2. Actual yield of maize reached to 87 and 88% of its pure stand when maize plants were fertilized by 140 kg N/feddan under 2 : 1 pattern.

4.3.2. Relative crowding coefficient (RCC)

4.3.2.1. K values was increased by increasing N-level up to 140 kg N/feddan and increasing plant density of mungbean.

4.3.2.2.The values of RCC of maize were higher than those of mungbean.

4.3.3. Aggressivity (A):

4.3.3.1. Maize was more aggressivity in 6 treatment when adding 120 or 140 kg N/feddan under intercropping of 2 : 2 or 2 : 3 pattern, whereas mungbean was dominated in all treatments.

4.3.3.2. Maize had positive aggiressivity, values while mungbean had negative values of aggressivity .

4.4. Effect of the interaction between three factors :

4.4.1. Land equivalent ratio (LER):

4.4.1.1. The best LER was obtained when intercropped T.W.C. 321 maize variety with three rows of mungbean (75% of its pure stand) and fertilized by 140 kg N/feddan.

4.4.1.2. Maize was better and more contributer in LER in all treatments. Mungbean was not exceeded than 50% of its pure stand in 5 and 8 treatments in the first and second seasons, respectively.

4.4.2. Relative crowding coefficient (RCC):

4.4.2.1. The highest value of RCC was achieved with intercropping pattern 100% of Giza 2 maize variety + 75% of mungbean and applied 140 kg N/feddan in both seasons.

4.4.3. Aggressivity (A):

4.4.3.1.The over story intercrop has higher competitive abilities than mungbean as the under story component under the interaction between the three factors in both seasons.

4.4.3.2. In general maize was the dominant with positive A values and mungbean was dominated one with negative A values in all treatments under study.