Effect of Intercropping and Agricultural Periods into Some Winter Vegetable Crops for the Quantitative Characteristics on Broad Bean *Vicia faba* L. var. acwadlgy

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Abstract:
An experiment was conducted out in Nursery of Baquba/Agriculture Department, Diyala in Autumn season of 2009-2010. The aim was to investigate the intercropping between beans *Vicia faba,* onion *Allium cepa,* garlic *Allium sativum,* and the best agriculture periods for the quantitative characteristics in fields.

Three crops were planted in four dates, 15/9, 1/10, 15/10 and 30/10/2009. The crops were set out in rows width one meter, in three parts: Bean alone (monoculture) on both sides of the rows, the bean in side and onion in opposite side, and the bean in side and garlic in other side. Both garlic and onion were brought from the local market.

The percent and period of germination bean seeds, the period between germination until flowering starting, the mean of height of plant, the mean of branches/plant, the weight of fresh and dry yield Kg/m^2, have been conducted. The data was statically analysis, as variance (ANOVA) test in factorial design experiments. The mean of the results was compared with least of significant differences level of 0.05.

The results indicated that the best period of planted were bean interference with onion and garlic on first and middle of October. The differences were significant comparing with date of middle August and the end of October for all the investigated characteristics. Whereas the earlier date of planted was significant, comparing with the most of other characteristics, except for period of germination percentage.

The results were showed very strong relationships between bean intercropping with onion and garlic in style of agriculture in most of characteristics study.

The conclusions were indicated that planted broad bean with onion and garlic was the best manner for production per unit area in agricultural aims, comparing with monocular bean alone, but the intercropping plants may be required more effort and service than monocular culturing.

Introduction :

Intercropping agriculture style is respect as technology had been inherited from very long time for many hundred years ago. The farmers had earned from each other, as well as, the circumstances of weather, and the shortage of period season, and also the limited agricultural area. There are many styles were applied for intercropping has been used in seasonal period (as planted summer crop before the end of the first crop, and vice versa), and the local intercropping, (as planted winter crops in the same land), or intercropping aired plants with halophytes plants, (John and Stephen 2009).

The most important for this style of agriculture was the seasonal intercropping, in this manner, could planted cow pea var. Al-rahawia, successfully intercropping in the same field with seed beds of summer vegetable in coastal of Tigris river, and could avoid lost of seasonal plant for cow pea, and this represent the optimum for utilization of unit area, and in the same time, keep the soil in fertilization state (Al-Rawi 1967; Sadok *et al.* 2008). Therefore, could be planted cloves of garlic and onion seedling for earliest varieties in nursery land for winter vegetable onion, lettuce and cauliflower, (Al-Ageely 1977; Najeh (1)2010). There is possibility to sow seeds of wheat (earliest variety before harvested rice, directly after stop irrigation of rice field (weaned stage) sowing seeds wheat by hand at the same field. The amount of seeds in unit area more than the amount used when

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intercropping 50 kg/acre, whereas used 40 kg/acre, because of lost seeds, and did not filled some of these on the field's soil, its probability filled those seed on lie rice plants, at the end of seasonal growth. In harvest time of rice, seeds of wheat will be in starting germination stage, therefore, could reduced the germination time and the cost for preparing the land for the wheat crop, (Lithourgidis 2007; Al-Qurashi 2009). To success intercropping wheat with rice, must be the soil in suitable, not in highly moisture to avoid seeds decay or suffocation roots of radicals wheat (Al-Sankary 1976; Lal 2008).

The amount of fertilization (phosphate and potassium) will reduced to one third, added to the first crop sweet beet, when planted seedlings of egg plant on opposite side of rows. Whereas the amount of fertilizer will reduced to half when planted the two summer crops intercropping tomato with sweet beet . The reason for this reduction might be, existing of fertilizer store in soil as absorbed on the surface of particles of soil from recent season. When nitrogen fertilizer added in complete amount, whether crop or style of agriculture, the reason might be rapidly lost of those fertilizers, by washing or leaching from soil or by evaporation from the surface of soil (Al-Saeedy 1987; John and Stephen 2009).

The second style were planted many different crops in same area and in same field, in short different time of planting dates (Al-Sankary 1976; Borasen 1997; Lancon *et al.* 2007). This style was very complicated manner, and management difficulties, which could applied in garden 300-400 m^2, and with bigger house garden. The advised is to plant vegetable garden or ornamental plants intercropping trees or shrub plants (Al-Sagafe and Rowsen 1994), and advised to use this style of intercropping to avoid lost of crops, when infected disease or attached by insect, which probably infect one of them (Ramasary *et. al* 2004; Malezieux, *et al.* 2009). Applied of intercropping style at semi-aired land (not implied rains) by crops tolerate shortage rains, between and around the halophytes crops, which increased relative moisture in the field (Adigbo 2009). In general when used local intercropping, and planted two crops in the same field, which one of them is principle, and the other as second crop, (Smith *et al* 2009).

Material and Methods :

A - Material:

1 -3kg broad bean seeds var. akodolgy, brought from 'Horticulture and Forest General Company (Abu – Grebe) Baghdad – IRAQ.
2 - 5kg domestic bulblets white onion from local market.
3 - 3kg domestic garlic clove from local market.kg
4 - Balance to weight the crops, rang from 1-10 kg.
5 - Preparation field in about 1000 m^2 , which carefully plowing, and divides to rows in one meter wide.
6 -10 kg Nitrogen fertilizer (urea), 15 kg potassium sulfate and 10 kg mono ammonium phosphate.
7 - Insecticide and pesticide, which used when had been appear in the field.
8 - A ruler to measure the height of plants.

B - Methods:

The agricultural services such as water sprayed, fertilization, weeding, insecticide and disease control….etc. were conducted on all period of this experiment.

The first factor was (**A)** represent four agriculture periods of crops, and (**B**) represent the (2)style of intercropping (three style were used), with three replications.

1- Soak the seeds of broad bean var. akdology for 16 hours. Separate the garlic cloves and then select the good, big and healthy ones.

2 - Planted seeds bean on rows (in two side, in state of monoculture, or in one side and planted onion or garlic in opposite side in case of intercropping state).

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3- The design was as RCBD (Randomized Complete Block Design) according to factorial experiment. The first factor was for the dates of intercropping, the second one was for style of intercropping.

4 -The service processing was as dropping spied, handy weeding, thinning, fertilization plan was gobble manner and control disease and insects, when infect the crops under study.

5 - Registered data for statistical analysis, related to this study as following:

*The period of germination, which represent the periods of germination for bean seeds, started from planted seeds in soil.

* Percentage of bean germination alone (monoculture) as following formula:

Percentage of germination % = $\frac{Germinated\ seeds\ number}{All\ used\ seeds}$ X 100

*Period of flowering: The period (day) from flowering starting (alone or intercropping from the date of planted seeds crops in the field.

*The elongation of season growth, represent the period (day) which plant of bean in field (as alone or with onion or garlic), starting from the date of planted seeds until the harvest of crop as dry seeds.

*The height of plant (cm), measured the mean height of bean plant (monoculture or intercropping) by a ruler starting from maturation as starting green legume appear until the first harvest of green legume yield.

*The number of branches, and according to the number of branches per bean plant, as planted in separation state (monoculture) or intercropping, until starting stage.

*The amount of bean green legume in one square meter, for the bean monoculture or intercropping.

*The amount of dry seeds bean in one meter square planted alone or in intercropping state.

6 - The results for all characteristics mention above was analysis as (ANOVA) test and compare with the List of Significant differences $L.S.D_{0.05}$ (Al-Rawi and Khalafalla 1980)

Results and Discussion

First: germination period/day: Table (1) showed the following results:

●The best period for planted bean as intercropping with onion and garlic, comparing with monoculture was in 15/9 and later date 30/10. The earlier period was the best than later period, but not in significant difference, Table 1.

●The results showed there was relatively best intercropping in bean with garlic, but not significant.

● The results also did not showed the best intercropping, which is period or style?.

●Concluded that the period of germination for intercropping between bean and garlic or onion effected significantly, only in date of planted and did not effected by style of agriculture, nor intercropping between date and style, because might be there was short period between planted seeds and starting germination which was at two weeks at maximum period.

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Table 1: The effect of date and style agriculture. and intercropping between each other in period of germination of bean seeds, when planted intercropping with onion and (3)garlic.

	Style of agriculture (day)			
Date of planting	**Bean monoculture**	**Bean intercropping with onion**	**Bean intercropping with garlic**	**Mean of Agriculture period (day)**
15/9	**11.67**	**10.33**	**11.00**	**11.10**
1/10	**6.67**	**7.33**	**7.00**	**7.00**
15/10	**8.00**	**7.67**	**7.67**	**7.78**
30/10	**14.00**	**15.00**	**13.33**	**14.11**
Mean of style	**10.09**	**10.08**	**9.75**	**L.S.D$_{0.05}$ = 3.2**
L.S.D$_{0.05}$ = 4.32 mean style **L.S.D$_{0.05}$ = 2.49 mean (day) of intercropping**				

Second: germination percentage : Table 2 showed the following results:

• The best two dates for bean were at 1/10 and 15/10 and its significant different between them, comparing with the earliest dates 15/9 and the latest 30/10 for germination percentage.

• Style of interference between date and style of percentage germination for bean. More likely the reason was that was bean seed var. akodegy brought from trust source, that was 'Horticulture and Forest General Company.

Table 2: The effect of date and style and the interference between each other for germination percentage bean seed, when intercropping with onion and garlic .

	% style of Agriculture			
Date of Agriculture	**Bean monoculture**	**Bean intercropping with onion**	**Bean intercropping with garlic**	**% Mean of Agriculture date**
15/9	**74.00**	**76.67**	**75.67**	**75.45**
1/10	**84.33**	**86.00**	**84.00**	**84.78**
15/10	**81.67**	**83.67**	**87.67**	**84.34**
30/10	**71.33**	**74.00**	**72.00**	**72.44**
% Mean of style	**77.83**	**80.09**	**79.84**	**L.S.D$_{0.05}$ = 4.83**
% mean of Agricultural style L.S.D$_{0.05}$ = 6.25 **% mean of intercropping L.S.D$_{0.05}$ = 3.76**				

Third: flowering period / day: Table 3 monitor the effect of the date planting and style of intercropping between each other on the period of planted bean, until flowering starting: could noted the following:

•As in table 1 and Table 2, there were significant of the best date to get earlier flowering were 1/10 and 15/10, and there was significant difference between them and two later dates.

•The mean of style agriculture, got the best significant when bean planted intercropping with onion, and then bean with garlic, and this was the high significant than planted bean alone (monoculture). This mean that to get best earlier plant bean in period of flowering was to planted bean intercropping with onion.

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•The intercropping between date and style illustrate that the best date in significant for earlier flowering was when bean intercropping with onion 1/10, then planted those two crops on 15/10 , and then intercropping bean with garlic on 1/10.

Table 3: The effect of date and style of interference in period of planted bean seeds, until flowering (day) when planted this seeds intercropping with onion and with garlic.

	Style of intercropping (day)			
Date of Agriculture	**Bean monoculture**	**Bean intercropping with onion**	**Bean intercropping with garlic**	**Mean of date Agriculture (day)**
15/9	**65.33**	**56.67**	**61.00**	**11.10**
1/10	**59.67**	**50.00**	**56.00**	**7.00**
15/10	**62.22**	**53.00**	**57.00**	**7.78**
30/10	**74.67**	**60.33**	**64.67**	**14.11**
Mean of inter. (day)	**65.42**	**55.00**	**59.67**	**$L.S.D_{0.05}$ = 2.49**
Mean of agricultural style (day) $L.S.D_{0.05}$ = 3.37				
Mean of intercropping (day) $L.S.D_{0.05}$ = 1.49				

Fourth: Growth elongation: Table 4 indicate that the effect of date and style of intercropping in season growth elongation (number of days which crops stay in field from the date of seeds planted until the end of harvested crop). When planted bean intercropping with garlic and onion, and could noted the following points:

•The date on 15/9 got the best significantly for the best elongation season growth, then the date 1/10 comparing with earlier intercropping on 15/9. Whereas the late date 30/10 got the best significant shortest season growth, comparing with the rest dates.
•Any style of intercropping did not get any significant value in growth season elongation. Whereas the interference between date and style got the longest season growth, when planted bean alone, comparing with planted bean intercropping with onion and garlic.
•The anomalous results, which got its elongation of season growth, could interpreted as in (Solbern and Harper 2010), which intercropped onion with lettuce, where each plant as all organisms has biological period and the effect of service processing as nutrition and hormones processing, possible to elongate the age of organisms, but in limiting period.

Table 4: The effect of date and style of intercropping of elongation season growth of bean (day), when intercropping with onion and garlic.

	Style of Agriculture (day)			
Date of Agriculture	**Bean monoculture**	**Bean intercropping with onion**	**Bean intercropping with garlic**	**Mean of date Agriculture (day)**
15/9	**180.67**	**175.00**	**176.67**	**177.45**
1/10	**180.33**	**180.67**	**181.00**	**180.67**
15/10	**182.00**	**182.33**	**183.00**	**182.44**
30/10	**169.00**	**171.67**	**168.00**	**169.56**
Mean of inter. (day)	**178.00**	**177.42**	**177.17**	**$L.S.D_{0.05}$ = 3.57**
Mean of agricultural style (day) $L.S.D_{0.05}$ = 4.82				
Mean of intercropping (day) $L.S.D_{0.05}$ = 2.78				

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Fifth : Mean plant height: Table 5 illustrate the effect date and style of intercropping to the mean height of bean (cm) when intercropping with onion and garlic comparing with bean alone, as noted below:

•The two dates 1/10 and 15/10 was conduct the maximum significant mean height of bean plant, comparing with earlier date in 15/9 and the late date 30/10. The earlier date conduct best significant date than late date. Therefore the date of planted was very important for effecting the height of bean plant, and the best date for planted was in the earlier of October (5)until mid of this month.

•Intercropping bean with onion, conduct the best significant for the height plant, then bean intercropping with garlic, comparing with bean alone (monoculture). Whereas the interference between date and style illustrate that intercropping bean with onion conduct significant in mean height of bean (cm), when planted in two dates 1/10 and 15/10, then intercropping bean with garlic on date 1/10, comparing with bean monoculture for the rest of the dates.

Table 5: The effect of date and style intercropping in the mean height (cm), when planted bean intercropping with onion and garlic plants.

	Agricultural style (cm)			
Date of Agriculture	**Bean monoculture**	**Bean intercropping with onion**	**Bean intercropping with garlic**	**Mean of date Agriculture (cm)**
15/9	**46.67**	**62.33**	**54.33**	**54.44**
1/10	**59.33**	**74.33**	**67.00**	**66.89**
15/10	**57.00**	**71.67**	**62.00**	**63.56**
30/10	**40.00**	**46.33**	**44.33**	**43.55**
Mean of agricultural style (cm) $L.S.D_{0.05}$ = 6.10 Mean of intercropping (cm) $L.S.D_{0.05}$ = 3.51				**$L.S.D_{0.05}$ = 4.51**

Sixth- Mean of branching number per plant: Table 6 indicate that the effect of date and style, and the interference between them for the mean of branching per bean plant, intercropping with onion and garlic crop, which noted:

•The date 1/10 conduct the maximum mean of branching per plant, comparing with earlier date on 15/9, and late date 30/10. Whereas the date of 15/10 conduct the best significant, comparing with the late date 30/10, and the best one, but not significant with date earlier 15/9.

•Intercropping bean with onion conduct significant branching per plant, comparing with bean monoculture. Whereas this superiority was not significant, comparing with garlic crop, one. This results illustrate that maximum means for branching in bean plant, when intercropping with onion.

•Intercropping bean with onion on date 1/10 conduct the best significant value, comparing with the rest of planted style, then bean intercropping with onion on date 15/10, and then with garlic in two dates 1/10 and 15/10, comparing with monoculture bean.

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Table 6: The effect of dates and style of interference, for the mean of branching per plant, when intercropping bean with onion and garlic crops.

	Agricultural style (branch/plant)			
Date of Agriculture	**Bean monoculture**	**Bean intercropping with onion**	**Bean intercropping with garlic**	**Mean of date Agriculture branch/plant**
15/9	**4.00**	**6.33**	**5.33**	**5.22**
1/10	**4.67**	**8.67**	**7.33**	**6.89**
15/10	**4.33**	**8.00**	**7.33**	**6.55**
30/10	**2.33**	**3.33**	**2.67**	**2.78**
Mean branch/plant 3.83		**6.58**	**5.87**	**L.S.D$_{0.05}$ = 1.55**
Mean of agricultural style branch/plant L.S.D$_{0.05}$ = 2.09 Mean of intercropping branch/plant L.S.D$_{0.05}$ = 1.21				

Seven: Mean of green legume yield: Table 7 illustrate the effect of the date and style of the interference for each other, on the yield of green legumes (kg/m^2), when intercropping bean with garlic and onion, and could noted the following points:

•The two dates 1/10 and 15/10 were conducted significant in yield amount comparing with later date 30/10. This mean that the best date for the bean crop production of green legume was in dates 1/10 until 15/10.

•The best style of intercropping conducting when bean with garlic crop which got green yield was conducted superior by 470 gm/m^2 than monoculture bean by 360 gm/m^2 .

•The interference between date and style, illustrate that intercropping of bean with onion on two dates 1/10 and 15/10 got the maximum yield significant of green legume (kg/m^2), then intercropping bean with garlic in the same two dates, comparing with monoculture bean for the rest of dates.

Table 7: The effect of date and style of agriculture on the mean yield of green legume weight (kg/m^2), when intercropping between bean with onion and garlic crops.

	Agricultural style (kg/m^2)			
Date of Agriculture	**Bean monoculture**	**Bean intercropping with onion**	**Bean intercropping with garlic**	**Mean of date Agriculture kg/m^2**
15/9	**1.49**	**1.76**	**1.75**	**1.67**
1/10	**2.08**	**2.31**	**2.51**	**2.30**
15/10	**1.93**	**2.11**	**2.36**	**2.13**
30/10	**1.26**	**1.51**	**1.61**	**1.46**
Mean of style kg/m^2 1.69		**1.92**	**2.06**	**L.S.D$_{0.05}$ = 4.32**
Mean of agricultural style kg/m^2 L.S.D$_{0.05}$ = 0.13 Mean of intercropping kg/m^2 L.S.D$_{0.05}$ = 0.08				

Eight: Mean of Total dry seed yield: Table 8 illustrate the effect of date and style agriculture and interference between each other, by the mean of dry seeds yield (kg/m^2) when bean intercropping with onion and garlic crops, and could noted:

•The best for the bean in disregarding of style (intercropping or monoculture), which dates 1/10, 15/10, and 15/9 respectively, were significantly difference between those three dates, comparing with the later date 30/10.

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• Intercropping bean with garlic was significant in yield, comparing intercropping with onion, and this style superior significantly comparing with monoculture bean.
•The interference between dates and style agriculture illustrate that, intercropping bean with garlic in 1/10 was significantly superior of dry seeds, then intercropping with garlic in date 15/10 and with onion 1/10.

Table 8: The effect of the date and style of planted crops for the mean of dry seeds yield (kg/m^2) for the bean when intercropping with onion and garlic crops.

	Agricultural style (kg/m^2)			
Date of Agriculture	**Bean monoculture**	**Bean intercropping with onion**	**Bean intercropping with garlic**	**Mean of date Agriculture (kg/m^2)**
15/9	**0.83**	**1.76**	**1.00**	**1.28**
1/10	**1.26**	**2.11**	**1.93**	**1.77**
15/10	**1.17**	**2.02**	**1.84**	**1.68**
30/10	**0.75**	**1.41**	**1.02**	**1.06**
Mean of style kg/m^2	**1.00**	**1.83**	**1.47**	**$L.S.D_{0.05}$ = 0.15**
Mean of agricultural style (kg/m^2) $L.S.D_{0.05}$ = 0.21				
Mean of intercropping (kg/m^2) $L.S.D_{0.05}$ = 0.22				

*Concluded that agriculture of any green crops weather by style interference or come after garlic in first priority or with garlic in second priority to conduct production yield amount superior than any crop intercropping or come after. The reason for that, might be because existence of chemical material in garlic, which give these crops intercropping immunities or tolerance of attaching insects or infected disease in the local land (Thomas *et. al.* 2000; Lancon, *et al.* 2007).

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