Studies on intercropping sunflower with Soybean

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This investigation was conducted in 1982 and 1983 seasons at SidsAgricultural Research Station , Beni Seuf Governorate , Egypt , tostudy the effect of eight different intercropping patterns on yieldand other agronomic characters of soybean (Glycine max (L.) Merrill)and sunflower (Helianthus annuus L.) .This study included two experiments as followA - Intercropping Ca Ll.andaoybaan with Majak sunflower •B - Intercropping Calland soybean with Ala sunflower .The treatments for each experiment were :1. Solid planting of soybean A constant population of 140,000 plants/fad. was attained by thinning to one plant per hill , 5 cm apart inone side ridge of 60 cm width ”2. Solid planting of sunflower: A constant sunflower population of23,333 plants/fad. was attained by leaving one plant per hill, 30 cmapart , one side of 60 em width •3. Pattern I: planting one side ridge of soybean (140,000 plants/fad.) alternating with one ridge of sunflower, one plant per hill(23,333 plants/fad.) •- 108 -..4. Pattern II: Planting one ridge of soybean on both sides (280,000plants/fad.) alternating with one ridge of sunflower, one plantper hill (23,333 plants/fad.) .5. Pattern III: Planting two ridges of soybean on one side in each(140,000 plants/fad.) alternating with two ridges of sunflower,one plant per hill (23,333 plants/fad.)6. Pattern IV : Planting two ridges of soybean , on both sidesIf;(280,000 plants/fad.) alternating with two ridges of sunflower,one plant per hill (23,333 plants/fad.)7. Pattern V : Planting one sLde ridge of soybean (140.000 plants/fad.) alternating with one ridge of sunflower, two plants per hill(46,666 plants / fad.) •8. Pattern VI: Planting one ridge of soybean on both sides (280,000plants/fad.) alternating with one ridge of sunflower, two plantsper hill (46,666 plants/fad.) •9. Pattern VII : Planting two ridges of soybean on one side (140,000plants/fad.) alternating with t1;07r0idges of sunflower , two plantsper hill (46,666 plants/fad.) .10. Pattern VIII : Planting two ridges of soybean , on both sides(280,000 plants/fad.) alternat:lng with two ridges of sunflowertwo plants per hill (46,666 plants/fadSoybean was planted on May 20 and 25 in 1982 and 1983 seasons •respectively • three weeks later sunflower was planted . Both cropswere treated with the normal agronomic practices according to theMinistry of Agriculture recommenda1:ions • Soybean was harvested onSep •• 22 and 25 in 1982 and 1983 seasons • respectively . Whilesunflower was harvested on Sep .• 24 • 30 and 9 ,17 in 1982 and1983 seasons for Majak and Ala varieties, respectively.The results could be summarized as followsI - 1. Intercropping Calland soybean with Majak sunflower significantlyincreased LA! of soybean compared with solid planting . Theincrease in LA! was more clear where a dense soybean populationwas grown (patterns II • IV • VI and VIII) .In the second experiment where Calland soybean was intercroppedwith Ala sunflower ,LAI of soybean grown at a dense populationsignificantly exceeded that of solid planting •2. Intercropping Calland soybean with Majak sunflower significantlyreduced plant height of soybean compared with solid planting •The reduction in plant height varied according to the densitiesand the arrangement of the t~o components .In the second experiment whe,re Ala sunflower was grown , plantheight of soybean was not greatly affected by inter cropping •__3. Number of branches/plant was affected by intercropping where amarked reduction has been rec:orded • The reduction was moreclear where a dense population of soybean and (or) sunflower wasgrown •In the second experiment with Ala sunflower such reduction innumber of branches/plant was only significant under the densesoybean population (patterns II , IV , VI , and VIII).4. Intercropping in general and n dense intercropped soybean populationin particular reduced the yield components of soybean ,namely , number of pods/plant , number of seeds/plant, 100-seedweight and seed yield per plant • The reduction in yield componentswas quite evident in

both experiments with both sunflower varitiesused.5. Solid planting of soybean significantly outyielded intercroppedsoybean as a result of growing soybean on 50% of the actual areaof solid planting •Intercropping soybean at highl:!.drensities (patterns II , IV , VI ,and VIII) produced higher seed yields compared with soybean atlower densities (I , III , V , and VII) • These results weretrue in both seasons as well as with both intercropped sunflowervarieties •In Calland/Majak association the relative seed yield of soybeanranged between 46 and 49 % wh.en one side of the ridge was grownas an average of both seasons • while a dense population ofsoybean (both sides of the ridge) yielded from 63 to 66 of thepure stand yield •In Calland / Ala association the: two years average of soybeanseed yield was from 4S to 48 % of the pure stand yield whensoybean was grown on one side of the ridge • While soybeaninter cropped on both sides yielded from 59 to 66 % of the purestand yield •6. Intercropping reduced protein content in soybean seeds comparedwith soybean in pure stand •7Some intercropping patterns re:corded higher oil content insoybean seeds than the pure stand seeds when Calland soybeanwas inter cropped with Majak s1mflower. While Calland interincreasedoil content in soybean seeds and decreased proteincropped with Ala showed no s:lgnificant response with regard tooil content. But a dense p,:>pulationof sunflower plantcontent •I I - SUNFLOWERcantly increased LAl of sunflower plants •1. Intercropping soybean with ej~ther Majak or Ala sunflower sign1£i-LAI at higher population deJ:lsities(pat~erns V , VI , VII andVIII) was greater than in lower densities (patterns I , II tIII and IV) •2. Intercropping Calland soybean with Majak sunflower almostreduced plant height • The reduction was more pronounced athigher population densities of sunflower • With Ala sunflowerintercropped with Calland soybean similar trend was alsorecorded •3. Stem diameter of sunflower intercropped at low populationdensity was greater than in sol:idplanting or at dense population• Results of the second e,~ertment showed also similartrend •With regard to number of leaves per sunflower plant no cleareffect for inter cropping could be detected for both varietiesin both seasons • This character was not influenced by intercropping•Intercropping either Maj ak or Ala sunflower at low density withCalland soybean produced greater head diameter compared withsolid planting and 1ntercropping at higher sunflower densityMost of the intercropp1ng patteras reduced husk percentage ofsunflower seeds compared with solid planting •The weight of lOO-seed of sunflower intercropped at lower densityalmost outweighed that of solid planting or of the dense population• Such result was more clear with Ala sunflower thanMajak variety •8. Intercropping patterns at low popu l.atLon density of sunflowerincreased seed yield per plant compared with solid planting onother intercropping patterns • Such result was clear in bothexperiments with Maj ak or Ala sunflower •9. Intercropping significantly reduced sunflower seed yield comparedwith sole planting as a result of the reduction in actual areagrown. • However , all intercropping patterns of Majak sunflowerproduced higher seed yield thar. the expected yield • The yieldat dense sunflower population WeI.S significantly higher than atlower population.On the two seasons average relative seed yield of Majak sunflowerranged between 52 and 59 % at low density and 71 and 80% at higherdensity compared with solid stand yield •With Ala sunflowe~ the corresponding values were 44 7” 49 % forlower density and 72 - 78 % at higher density •It was also evident that Majak sunflower had better yield capacitythan Ala variety.10. Oil content in sunflower seed wal~ favourably affected by intercroppingwhere a marked increal~e in oil percentage was recordedin most intercropping patterns eompared with sole cropping •III- Competitive Relationships and yiE!ld advantage of Intercropping :1. Intercropping soybean with sunfl(~er increased LER. When Callandsoybean was intercropped with Majak sunflower the land usage hasbeen increased in 7 patterns out of 8 on the two seasons average.Growing dense population of soybean as well as sunflowerincreased the LER values •The highest LER values were obtained when both crops were grownat higher population densities where LER reached 1.35 and 1.43for patterns VI and VIII. respectively on the two years average •When Calland soybean was interl::roppedwith Ala sunflower, LERvalues exceeded 1 in 6 patte:rns out of 8·. A similar trendwas obtaine~ where pa~terns VI and VIII produced LER values of1.37 and 1. 36 on the average. r1aspectively •2. The relative crowding ccef’fLcLent; (RCC) or K value of intercroppingwas greatly influenced by the population density of bothintercrop components • K value:s exceeded 1 in 7 patterns in thefirst experiment and in 6 patt1arns in the second one •RCC (K value) reached its ma.:rlmum where both species wereintercropped at dense popukat Lon (patterns VI and VIII) in

bothexperimentsThe product of Rce· reached 4.22 and 6.99 for patterns VI and VIII,respectively as the two years a~erage for Calland/ Majak association.In Calland/Ala association K values averaged 5.17 and 4.70 , respectivelyfor patterns VI and VIII • including dense population ofboth species •3. The estimation of Aggr8ssivity (A) 8S an average of.both seasonsof experimentation showed that in Calland/Hajak mixture • soybeanwas the dominant component only in 2 patterns out of 8(patternsII and IV) • whereas sunflower was the dominant component inthe other 6 patterns .In the second experiment with Calland/ Ala mixture , soybeanwas the dominant component in 3 patterns (II • III and IV)while sunflower was the dominant component in the other 5patternsAggressivity was therefore. greatly affected by the populationdensity of the intercrops •/-