RESEARCH PAPER International Journal of Agricultural Sciences, January to June, 2010, Vol. 6 Issue 1 : 67-68

Source-sink relationship in soybean genotypes in summer season

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ABSTRACT

The newly developed soybean genotypes (*Glycine max*.L.Merril) grown in summer season, which have different yielding ability and duration tested for its better source-sink relationship in terms of leaf dry weight, total dry weight, leaf area, leaf area index, to overcome problem of quality seed production. The source-sink relationship among genotypes is different. The genotypes MAUS 61-2 had better source strength because of maximum number of leaves, high dry matter of leaves and high leaf area and leaf area index. Further MAUS-61-2 had better sink i,e high number of pods to accumulate more photosynthates as compared to other genotypes. JS-335 was the second best genotypes having best source and sink strength.

Key words : Soybean, Source strength, Sink strength

INTRODUCTION

The application of terms Source and Sink has gained considerable importance from their early use in translocation studies. Source and sink are functional description of plant organ and tissues recognizing their ability to supply or use a particular metabolite substance.

Soybean (*Glycine max* L.Merill.) is an important legume and oil seed crop. It is self pollinated and have short photo period. Recently the cultivation of soybean is increasing day by day in Maharashtra.Which might be due to its certain benefits like response to yields in all season, short duration, least pest and disease attack and high yielding with good market value.

In order to increase yielding ability in soybean it should have high source as well as sink strength. Source strength in terms of leaf dry weight, total dry weight, leaf area, leaf area index, chlorophyll content must be maximum and sink strength in terms of number of pods, number of seeds per pod, number of seeds per plant, seed weight should maximum.

Generally soybean is cultivated in monsoon, however, it may be cultivated in summer and *Rabi* also. Earlier studies reported that summer and *Rabi* soybean also produce more or less similar yield (Borade, 1988).Unfavorable environmental condition like high rainfall, humidity,pest and diseases attack may reduce the seed production of soybean in *Kharif* season. Rains during maturity period may also deteriorate the quality of soybean seed. To overcome this problem of quality seed production the newly developed soybean genotypes of different durations *viz.*, MAUS 81,MAUS 61-2,MAUS-71,MAUS-47 and JS-335 tested for their better source-sink relationship in terms of leaf dry weight, total dry weight, leaf area, leaf area index. Present investigation was carried out to see the performance of soybean genotypes in summer season in order to fulfill the demand of quality seed when ther is failure of seed production in *Kharif* season.

MATERIALS AND METHODS

The experiment was laid out in vertisol in the field of Department of Agricultural Botany (Plant physiology) Marathwada Agricultural University, Parbhani during summer season (2003).The six genotypes of soybean were tried in present investigation. The sources studied were leaf area, leaf area index, and leaf dry weight.Whereas sinks studied were number of pod/plant, no. of seed/plant, weight of seeds/plant, average seed yield, biological yield and harvest index. The design of experiment was Randomized Block Design with four replications.

RESULTS AND DISCUSSION

Summer soybean yields are low in comparision to *Kharif* and *Rabi*,this might be due to the high temperature which affects the rate of photosynthesis, therefore, source-sink relationship is affected which results in low yield. Sources are the organ in which photosynthates are synthesized and sinks are the plant organs where these photosynthates are utilized which contributes towards yield.

The results in Table 1 indicate the genotype MAUS 61-2 produced high yield because it had better source-sink relationship, that means amount of dry matter or photosynthates produced by source organs translocated towards sink organ (economic part) and produced high yield. Panwal *et al.* (1988) also reported that plant characters such as leaf area as a source and higher flower

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Table 1 : Different Source strength of soybean genotypes

Genotypes	Leaf dry weight (gm)			Leaf area (cm^2)			Leaf area index		
	30DAS	60DAS	At harvest	30DAS	60DAS	At harvest	30DAS	60DAS	At harvest
MAUS 81	1.10	4.72	5.15	3.85	14.37	18.27	1.69	6.12	8.01
MAUS 61-2	1.11	4.95	5.02	4.14	15.28	19.76	1.84	6.78	8.78
MAUS 71	1.13	5.07	5.15	3.47	13.66	16.93	1.53	6.06	7.52
MAUS 32	1.19	5.10	5.29	3.39	14.32	17.32	1.50	6.36	7.69
MAUS 47	1.11	4.82	5.18	3.88	13.87	16.85	1.72	6.16	7.48
JS-335	1.15	5.35	5.35	4.26	14.83	19.37	1.88	6.89	8.61
S.E. $\pm$	0.019	0.105	0.071	.217	0.226	0.366	0.115	0.126	0.272
C.D. (P=0.05)	0.058	0.316	0.215	NS	0.686	1.700	NS	0.380	0.819

Table 2 : Different Sink strength of soybean genotypes

Genotypes	No. of pod/plant	No. of seed/pod	No. of seed/plant	Weight of seed/plant(gm)	Average seed yield (Kg)	Biological Yield (Kg)	Harvest index
MAUS 81	23.66	2.27	75.22	5.20	9.82	19.91	49.35
MAUS 61-2	51.41	2.43	95.74	9.10	14.12	27.69	51.09
MAUS 71	39.99	2.29	85.80	8.25	11.10	23.04	50.34
MAUS 32	47.49	2.31	84.15	8.75	10.47	20.50	51.06
MAUS 47	28.48	2.26	81.62	7.52	10.47	20.87	50.24
JS-335	37.65	2.33	88.22	8.85	12.57	25.05	50.32
S.E.$\pm$	1.267	0.101	2.210	0.509	0.236	0.619	0.877
C.D. (P=0.05)	3.810	NS	6.381	1.530	0.712	1.860	NS

number as a sink contributed to the better yielding ability in mung bean.

If source strength is affected which resulted in poor sink growth and if sink strength is affected, then source is unable to translocate the photosynthates due to poor sink capacity to store the photosynthates.

Further Table 1 indicated that the genotypes MAUS 61-2 had better source strength in terms of leaf dry weight, leaf area, leaf area index. Due to highest leaf dry weight the maximum photosynthates produced in leaf were translocated towards the sink(seed). Due to high leaf area and leaf area index, the maximum area was available for the process of photosynthesis, which led to increase photosynthesis rate and maximum synthesis of photoassimilates translocated towards the sink(seed). According to Shrivastava and Bhardwaj (1986) sources like leaflet, stipule and fruit wall (source strength) contribute in growth of sink like developing seed whereas defoliation resulted in poor pod growth.

Result in Table 2 revealed that the strength of all the genotypes, means amount of assimilate translocated from the source which was utilized by the sink organ (seed)

The genotype MAUS 61-2 had higher number of pods per plant means it possessed higher sink capacity to utilize the photoassimilates translocated from source. It resulted in highest number of seed per plant, more average yield,high biological yield and numerically highest value of harvest index, followed by JS-335 which also had better source-sink relationship.

Results revealed that the genotypes grown in summer season had low yielding capacity as compared to *Kharif*. Borade (1998) also reported that in summer season the yield level is low as compared to *Kharif* but the yield level in *Rabi* and summer was more or less same.

In the summer, the genotypes MAUS 61-2 had better source strength which synthesized maximum photoassimilates or dry matter and also have the better sink strength and capacity to accumulate or store these photoassimilates,which ultimately resulted in higher economic yield or average yield.

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Received : May, 2009; Accepted : July, 2009