Determination of leaf partitioning coefficient between spring rapeseed cultivars

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Introduction :

Brassica oilseed rape is one of the valuable oilseeds in which has been attracted attention in recently years so cultivation of rapeseed seems to be useful for lessening of imports of vegetative oils in Iran. Oilseed rape in comparison with other oilseeds have highest growth in recent decades and today has the third place after soybean and palm oil (Arvin ,2009).

Photosynthesis rate define as available carbon fixation in leaf. Regulation of carbon fixation rate in different metabolic pathways defined as a allocation(Taiz and Zeiger, 2010). Vascular bundles formed tube systems that can able to transform photoassimilate into different organs such as young leaves , stems , roots , fruits or seeds. Different distribution of photoassimilate within plant called partitioning (Taiz and Zeiger, 2010).

Stafford (1996) stated that remobilization from stem did not occur. Also he expressed that dry weight of oilseed rape leaves reduce during growth period and the most leaves dry weight reduction is associated with falling leaves. Leaves transform a bit part of their photoassimilate into pods that are placed in lower parts of canopy (Staford ,1996).

Leaves in brassica oilseed rape are fundamental sources of photosynthetic production. In spite of quickly leaves senescence in pod development stage , the leaves photoassimilate form some highlight structure like as number of pod or number of seed per pod (Azizi et al.,1999). remobilization overall photosynthetic material from leaves to other parts of canopy happen at leaf senescence stage. After falling leaves , ultimately both stems and pods are important sources of photoassimilate production (Major et al., 1978).

Material and method:

The experiment was conducted on 2007 growing season at Agriculture and Natural Resources Research Station of Torogh, Mashhad in East-North of Iran (36˚ N , 59˚ E , 1003 asl and annual rainfall 286 mm). soil texture was silty loam..

Experimental design was Randomized Complete Blocks with 4 replications. 13 cultivars from rapeseed species were sown at 20 February 2007 . Cultivars of Hyolla 401, Hyolla 330, Option 500, Sarigol, RGS003, Zarfam, Echo and Swchotshot were belonged to *B .napus* species. Hysun 110, Rinbow, Goldrush and Parkland were belonged to *B.rapa* species, and BP.18 was a part of *B.juncea* species.

Leaves and stems were separately taken from three plants of each plots. Sampling of leaves and stems were dried at 70 $^{\circ c}$ for 48 hours and next were weighted. Measurement of dry matter was done weekly.

In order to determine of partitioning coefficient for different organs , below formula was applied(Rizzalli et al.,2002) :

$$PC_i = \frac{\Delta DM_i}{\Delta DM_{tot}}$$

Where Pc_i : dry matter distribution coefficient for i organ interval between sampling ; Δ DMi : change of dry matter of singular organ between sampling ; Δ DMtol : change of total shoot dry weight in the desired organ in the interval between sampling.

Finally , relationship between cumulative dry matter for each organ (leaf and stem) versus cumulative dry matter for shoot were calculated and slope of this equation gave the dry matter distribution coefficient.

All data were analyzed statistically using SAS 9.1 package and all graphs were drown using Excell.

Result and discussion:

Distribution coefficient for cumulative leaf dry matter versus cumulative total shoot dry matter was obtained by using regression fit (table 1). Rate of determination coefficient (R^2) and coefficient of variation (CV) of leaf was defined. There were considerable difference among cultivars for leaf partitioning coefficient based on rate of ±SE.

Goldrush and Zarfam with 0.68±0.076 and 0.68±0.74 had the most and BP18 with 0.22±0.15 had the least gram leaf dry matter per gram total shoot dry matter respectively at final stage of flowering (table 1).

The highest partitioning coefficient in Goldrush and Zarfam were justifiable because these tow cultivars had winter-spring nature and also placing in spring planting regime leaded to incomplete vernalization so receiving insufficient of coldness units caused more vegetative growth and production of more leaves for these cultivars rather than others.

Having eminent characteristic of Zarfam and Goldrush including high leaf partitioning coefficient , suitable architecture, emergence of early phenological stage and so on , can be predictable if these tow cultivars are placed at appropriate regimes so it can lead to formation more yield.

Lower partitioning coefficient for BP18 was due to (Azizi et al., 1999) small structure of leaves belong to this species (*Brassica juncea*) rather than tow other species(*Brassica napus* and *Brassica rapa*) .

Its clear that availability of production inputs such as water, solar radiation, nutrition, carbon dioxide, temperature , especially in vegetative period causes production of more vegetative dry matter. We concluded that interval between initiation and cessation of flowering , majority part of photoassimilate were devoted into stems (fig. 1,2).

The reasons of this processes can be explained in this way:

First , falling leaves occurred during , especially last of flowering so leaf dry matter contribution ratio to total dry matter decreased so these may be inferred that in this stage , stems had priority for receiving photosynthetic materials than leaves had. On the other hand , lessening trend of partitioning photosynthetic materials into leaves was related to falling leaves physiology(Diepenbrock , 2000).

Comprehensive studies in future on leaves , as the main source of capturing and converting of solar radiation , should be done so better understanding of principals of yield formation especially in Brassica oilseed rape can be both useful and helpful for boosting more production per unit land area per unit time.

Table 1. Material partioning coefficient into leaf , Determination coefficient(R^2) and Coefficient variation (CV) in spring oilseed rape cultivars

%) CV(	Determination coefficient)R^2(	Material portioning coefficient into leaf gr / gr	Replication	cultivars
22.14	0.88	0.26±0.098	4	*Hyolla 401*
22.03	0.86	0.34±0.13	4	*Hyolla 330*
9.86	0.99	0.45±0.65	4	*Option 500*
10.9	0.97	0.38±0.071	4	*Sarigol*
4.6	0.99	0.33±0.028	4	*RG003*
7.9	0.98	0.68±0.074	4	*Zarfam*
24.5	0.29	0.34±0.21	4	*Parkland*
5.8	0.98	0.68±0.076	4	*GoldRush*
13.08	0.83	0.24±0.71	4	*Echo*
2.69	0.99	0.3±0.16	4	*Swchotshot*
33.86	0.68	0.22±0.15	4	*BP18*
11.28	0.97	0.34±0.059	4	*Rinbow*
14.32	0.58	0.25±0.0103	4	*Hysun 110*

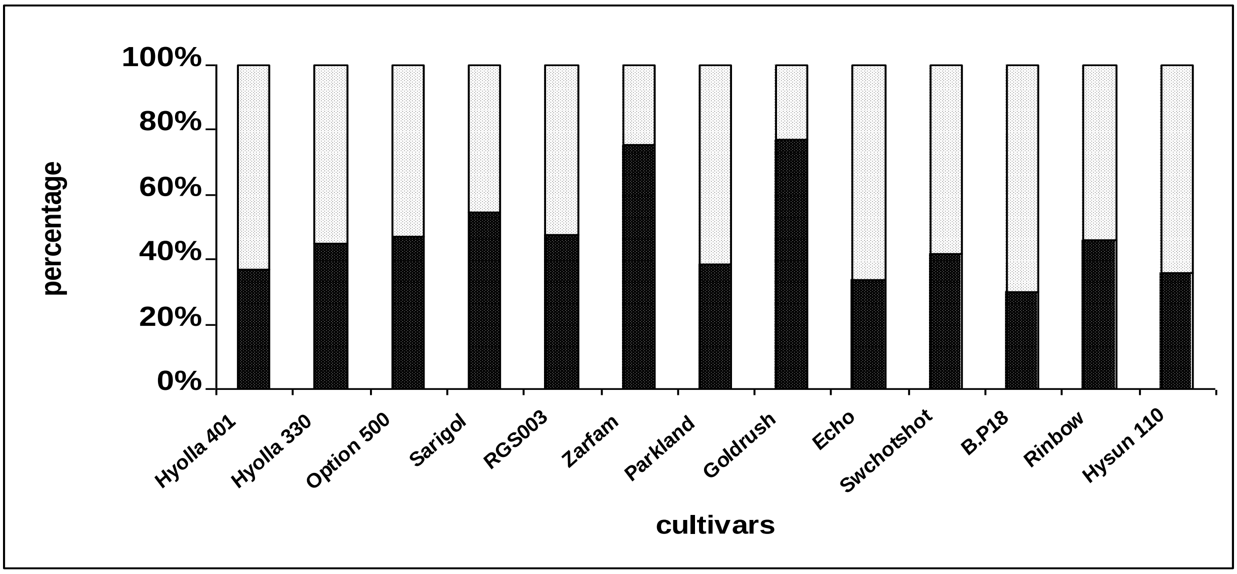

Fig. 1 . percentage of dry matter into organ (white part = stem and black part=leaf) at initiation of flowering

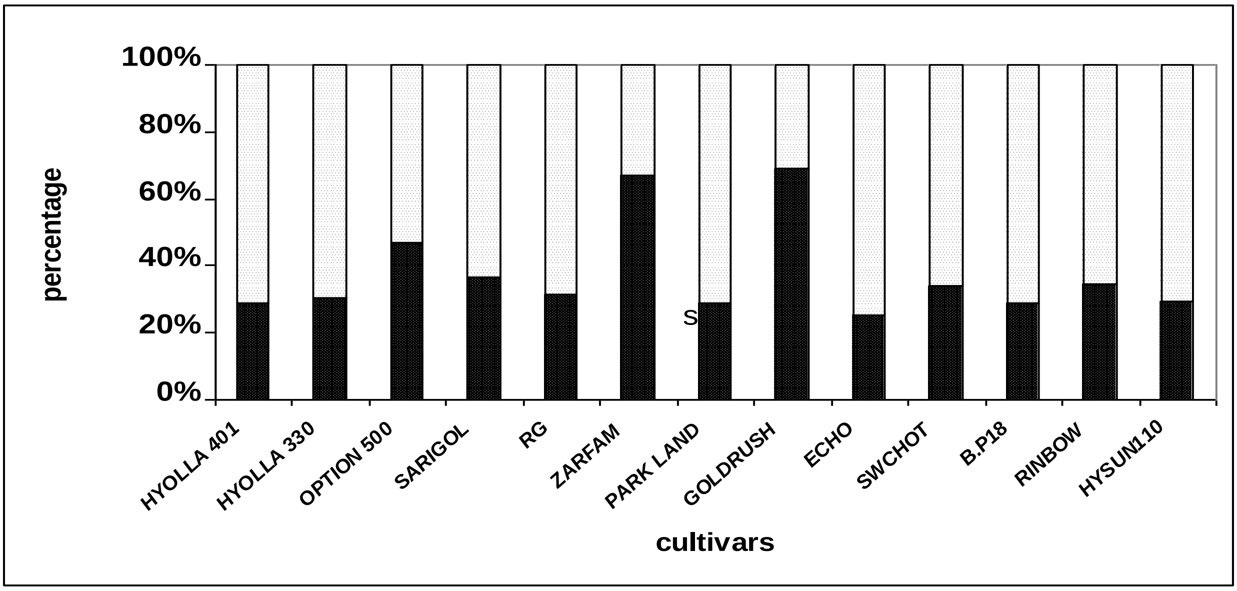

Fig. 2 . percentage of dry matter into organ (white part = stem and black part=leaf) at cessation of flowering