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SHORT COMMUNICATION

VARIABILITY IN NITROGEN DISTRIBUTION IN *BRASSICA* SPECIES AT FLOWERING AND HARVESTING STAGE

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The study was conducted to examine the variation in the pattern of nitrogen distribution in different plant parts of *Brassica* species. In a field experiment, eleven genotypes of three different species of *Brassica* viz. *B. napus* var GSB-7027, ISN – 114, ISN – 602 and GSL – 1, *B. juncea* var RLM 619, RLM 198, Kranti and Varuna and *B. campestris* BSH 1, SPAN and KBS 1 were analyzed to understand the possible differences in the pattern of nitrogen distribution and partitioning in different parts of the plant at 50% flowering and maturity among *Brassica* species. *B. campestris* contained highest percentage of nitrogen at 50% flowering and at maturity stage compared with *B. napus* and *B. juncea*. At harvest more than 60% reduction in nitrogen in different plant parts of all the three *Brassica* species indicated the utilization of assimilates from component plant parts for the seed formation. However, the significant genetic variation in *Brassica* species for nitrogen content of all the component plant parts was observed thereby indicating different nitrogen uptake rates and its distribution. The study indicates that *B. campestris* was best among the three different species of *Brassica* for partitioning of nitrogen from leaf to seeds and it can be used for varietal improvement for getting maximum yield.

Key words : **Nitrogen allocation, plant nitrogen, rapeseed mustard.**

A suitable breeding methodology and identification of superior parents are the important pre-requisites for the development of suitable genotypes. Selection of plants on the basis of genotypic variation in nutrient uptake and its partitioning in the different component of plant could be an effective and suitable way for crop improvement (Gerloff 1963, Vose 1963, Gabelman 1976, Patel 2000, Singh *et al.* 2001). In general, correlation exits between leaf nitrogen content and photosynthesis. Despite good correlation coefficient between photosynthesis and nitrogen contents across diverse species, there is a significant variation in photosynthetic capacity per unit of nitrogen (Evans 1989). The change in the pattern of distribution of nitrogen has an impact on plant productivity. Therefore, a sound understanding of nitrogen distribution involved in the expression of various yield attributes is of prime importance in formulating any breeding methodology (Khulbe *et al.* 1999). Considering the costs of nitrogenous fertilizer and existence of genotypic variation in nitrogen distribution and its utilization in *B. napus* (Yau and Thurling 1986), selection for more efficient use and partitioning of nitrogen seems to be justified. The present study was conducted to examine the possible differences between *Brassica* species, firstly in the pattern of nitrogen distribution at flowering and maturity stage and secondly, in the pattern of the proportional allocation of total nitrogen to the component parts of the mature plant.

Eleven genotypes of three different species of *Brassica* viz. *B. napus* var GSB-7027, ISN-114, ISN-602 and GSL-1, *B. juncea* var RLM 619, RLM 198, Kranti and Varuna and *B. campestris* var BSH 1, SPAN and KBS 1 were used as experimental material. The experiment was conducted during rabi season of 1999

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and 2000 at the experimental farm, Sher-e-Kashmir University of Agricultural Sciences and Technology, R.S. Pura, Jammu. The soil of the experimental plot was clay-loam (pH 7.3). The experiment was laid out in randomized block design with three replications. In each replication, four plants were used for each parameter. Plants were harvested at 50% flowering and maturity and separated into three parts viz. leaves, stems and pods. Nitrogen was analyzed in seed, developing buds, leaves and stems as reduced nitrogen using N-Kjeltech Auto 1030 analyzer (Tecator 1987).

Statistical analysis of the data was done by analysis of variance (ANOVA) given by Panse and Sukhatme (1967). The critical difference (CD) values were calculated at 1% probability level.

Significant differences in nitrogen content among different cultivars of different *Brassica* species was observed at flowering and maturity stage. An analysis of variance of all the cultivars of three different species of *Brassica* showed significant differences for all the traits at flowering and harvesting (Table 1). Among *B. napus* cultivars, ISN 602 had highest nitrogen content in leaves (1.66%) and developing pods (4.09%) at flowering stage. However, at maturity, GSL 1 had highest nitrogen content in seed (4.77%) and stem (0.99%). In *B. juncea*, highest nitrogen content in developing pods (4.14%), seed (4.45%) and plant nitrogen (2.34%) was observed in Kranti but RLM 619 showed highest nitrogen content in leaf (1.86%) at flowering stage. *B. campestris*, also showed variability in nitrogen content among different cultivars. In *B. campestris*, highest nitrogen content of leaf (1.95%), stem (1.59%), developing pods (3.95%), seed (4.47%) and plant nitrogen (2.35%) was observed in KBS 1 (Table 2). Variability in the nitrogen content among different cultivars and different species of Brassica could be due to the genotypic differences in the uptake and partitioning of nitrogen. Earlier reports suggest that the differences in partitioning of nitrogen into various compartments/enzymes of the plants among species are significant. For example, in rice leaf, about 27% of the total nitrogen is present in rubisco (Makino et al. 1997) compared with only 20% for wheat (Evans 1989). Similar to cereal crops, when *Phaseolus* was compared with Alocasia, there were differences in partitioning of nitrogen. Our results are consistent with the earlier finding in *Brassica* (Gupta and Labana 1995, Singh *et al.* 2001) and related crops.

Distribution of nitrogen in different component plant parts was also different at different growth stages. We recorded less nitrogen in leaves and stems and more nitrogen in the seeds of all *Brassica* species at maturity stage. Leaf and stem nitrogen content declined with plant age because nitrogen seems to be mobilized from vegetative to reproductive organs (Feller 1979, Ogunlela et al. 1990). More than 60% nitrogen content was diverted from leaves to seed, which emphasized the need of selection for characters such as nitrogen distribution. Partitioning of nitrogen into seed determines the yield of crop. (Pate and MacNeill 1979). Selection of correct genotypes would help growers by reducing fertilizer consumption and improving yields.

Among the three different species studied, average nitrogen content was more in *B. campestris* at all growth stages (Table 3). *B. campestris* var KBS 1 showed highest nitrogen content and partitioning of nitrogen among different plant parts was also more, specially partitioning of nitrogen from leaf to seeds. Similarly, *B. campestris* was best among three different species of *Brassica* and it can be used for varietal improvement for getting maximum yield.

Table 1. Analysis of variance of different species of *Brassica* for nitrogen.

Source	d.f.	Mean Square						
		Flowering			Maturity			
		Leaf	Stem	Developing Pods	Leaf	Stem	Seed	Plant
Replication	2	0.006	0.074	0.105	0.002	0.006	0.030	0.012
Genotypes	10	0.185*	0.019**	0.530**	0.135**	0.137**	0.110**	0.351**
Error	20	0.005	0.001	0.021	0.001	0.0004	0.004	0.019

** Significant at 1% level, d.f. = degree of freedom.

Table 2. Percent nitrogen in different plant parts of *Brassica* species at flowering and maturity stages.

Species/Genotypes	Flowering			Maturity			
	Leaf	Stem	Developing Pods	Leaf	Stem	Seed	Plant
B. napus							
GSB 7027	1.27	1.39	2.82	0.34	0.86	3.80	2.00
ISN 114	1.38	1.38	3.35	0.49	0.80	4.20	2.23
ISN 602	1.66	1.36	4.09	0.67	0.76	4.35	2.29
GSI 1	1.52	1.46	3.03	0.55	0.99	4.77	2.21
B. juncea							
RLM 619	1.86	1.50	3.92	0.78	1.24	4.18	2.12
RLM 198	1.25	1.59	3.82	0.31	1.25	4.03	2.11
Kranti	1.34	1.51	4.14	0.47	1.18	4.45	2.32
Varuna	1.35	1.46	4.22	0.51	0.98	4.29	2.22
B. campestris							
BSH 1	1.79	1.55	3.88	0.82	1.30	4.20	2.09
SPAN	1.58	1.53	4.22	0.65	1.35	4.34	2.27
KBS 1	1.95	1.59	3.95	1.01	1.23	4.47	2.35
LSD	0.25	0.06	0.25	0.06	0.03	0.11	0.24

Table 3. Mean nitrogen of three different species of *Brassica* at flowering and maturity stage.

Species/Genotypes	Flowering			Maturity				
	Leaf	Stem	Developing Pods	Leaf	Stem	Mature Pods	Seed	Plant
B. napus	1.46	1.40	3.57	0.51	0.85	3.23	4.15	2.18
B. juncea	1.45	1.51	4.02	0.52	1.16	3.35	4.24	2.19
B. campestris	1.77	1.56	4.02	0.83	1.29	3.49	4.33	2.24

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