Experiment 3 : Nitrogen Partitioning in Maize Genotypes under Different Nitrogen Fertilization Levels and Soil Moisture Regimes

Objectives

To evaluate genotypes differences in the partitioning of total nitrogen among plant parts of maize differing in drought tolerance, during different growth stage when grown under contrasting levels of nitrogen and soil moisture.

Materials and Methods

The experiment was conducted on sandy loam soil at the farm of the Phitsanulok Field Crops Experiment Station, Phitsanulok, Thailand from December 1997 to April 1998 and repeated again during December 1998 to April 1999. Soil samples were collected and analyzed for soil physical and chemical properties at each plot differing in soil depth prior to sowing as showed in Appendix Table 1.

A strip split plot in randomized complete block design with four replications was used. Five moisture regimes : one closest and five farthest from the line source, are vertical factor while low and high rate of nitrogen fertilizers : 62.5 and 187.5 kg N/ha , are horizontal factor. Three maize genotypes : drought-susceptible, drought-intermediate resistant and drought-resistant, selected from the first experiment, are subplot. Each plot (12 x 15 m) was subdivided into two subplots (6 x 15 m) representing two nitrogen fertilizer levels. While each subplot was also subdivided into five moisture regimes (6 x 3 m) : one closest and five farthest from the line source. The cultural practices of this experiment was also undertaken the same as those in Experiment 2, except that the nitrogen fertilizers (ammonium sulfate) was used as a basal application and the rate is dependent upon each treatment.

Water applied was scheduled and calculated the same as those in Experiment 2. Plants samples were taken in each plot at 5 growth stages namely sixth fully expanded leaf (V_6) , twelvth fully expanded leaf (V_{12}) , silking (R_1) , dough (R_4) , and physiological maturity (R_6). Samples were separated into 4 plant parts in terms of leaf blade, leaf sheath, stalk, and kernel (when present) and dried in an oven at 60 °C for 48 h. Samples were grinded and kept in a stoppered glass bottles until dry weight and total nitrogen was determined. The total nitrogen was analyzed in the laboratory by Kjeldahl method as described by Bergersen (1980). Nitrogen use efficiency (NUE) was defined as kernel produced per unit of nitrogen supplied (Moll *et al.*, 1987).

Experimental areas was irrigated uniformly until 2 weeks after emergence and a line source sprinkler irrigation system was then installed in perpendicular to the rows until the crop reached physiological maturity stage (Appendix Table 2). Catch cans for measuring the amount of water application was installed above the canopy at 3.50, 6.50, 9.50, 12.5 and 15.5 m from the line source. Weekly irrigation was scheduled. The amount of water applied for wet regime was also calculated the same as those in Experiment 1. Water applied by line source sprinkler irrigation system decreased with increasing distance from the line (Figure 19).

Yield data were collected from four, 4-m long rows from each sub-subplot. Yield and yield components data were collected and determined as described in the experiment 1. Crop drought susceptibility index (DSI) and drought index (DI) were also determined the same as in Experiment 1.

The soil water table were determined as described in Experiment 1 and showed in Appendix Table 1.. The weather data, recorded during growing period in both years, was presented in Figure 2.

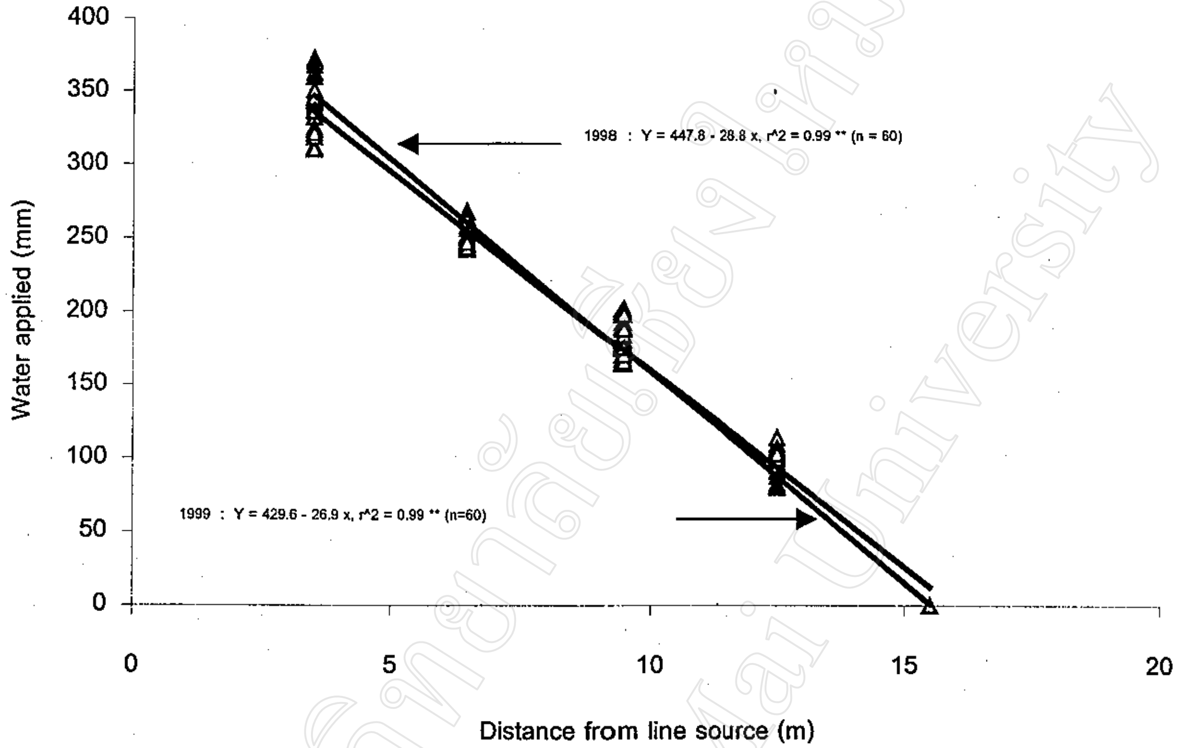

Figure 19 Relationship of water applied and distance from line source for maize experiment 3 in 1998 and 1999.

Results and Discussion

Growth and Development

The growth and development of maize genotypes under different moisture regimes and nitrogen levels during the two years were quite different. Variation in nitrogen supply affect growth and development of maize. Both vegetative and reproductive phenological stages could be delayed by nitrogen deficiencies (Uhart and Andrade, 1995). I found that all genotypes grown under low nitrogen (68.6, 67.8; 63.5 days after sowing (DAS) for NS 1, NSX 9210; SW 3601) was delayed in the time to 50% silking as compared to those grown under high nitrogen (65.0, 64.4; 62.7 DAS for NS 1, NSX 9210 ; SW 3601) , whereas , the time to 50% tasseling was less affected by low nitrogen. Girardin *et al.* (1987) also found that the only developmental parameter affected by nitrogen starvation was the time to silking. On the other händ, Pearson (1991) and Uhart and Andrade (1995) reported that nitrogen deficiency delayed in both tasseling and silking.

Where nitrogen stress, a commonly observed phenomenon in maize was delayed in silking, resulting in an increase in length of the anthesis-silking interval (ASI) (Lafitte and Edmeases, 1994). Generally, ASI has been used as an easily observed indicator of ear biomass at anthesis related to grain yield in field evaluations, particularly drought stress (Edmeades *et al.*, 1993) and nitrogen deficiency (Lafitte and Edmeases, 1994). ASI was strongly affected by nitrogen stress in this experiment. Nitrogen shortage showed an ASI increased from 0.9 to 3.4 days ; whereas, adequate nitrogen produced an ASI increased from 0.8 to 2.0 days among three genotypes.

Among the three genotypes, SW 3601 had a shortened ASI in both nitrogen treatments followed by NSX 9210 and NS 1, respectively (data not shown). Lafitte and Edmeades (1994) studies the relationships among full-sib progenies in maize indicated that high-yielding cultivars under low nitrogen gave the negative association between kernel yield and ASI. An increased ASI has usually been associated with the reductions in numbers of kernels per plant and in kernel yield (Edmeades *et al.*, 1993). Furthermore, an increase in the length of ASI was probably due to increase in intensity of drought stress in both nitrogen levels, however, an increased ASI at low nitrogen treatment had exactly greater than high nitrogen plot in both water application treatments.

Dry Matter and Nitrogen Content

The distribution of dry weight and nitrogen content among plant parts in both wet and dry regimes in 1998 are presented in Figure 20-23. During vegetative growth stage, all genotypes in both nitrogen supplies generally accumulated more dry weight and nitrogen content in the leaves, leaf sheath and stalk until reached the peak at R1 and gradually declined thereafter. Vegetative tissues particularly leaves and stalk were acted as a major sinks of photoassimilate and nitrogen during vegetative growth and then became as a source for kernel development during the kernel-filling period (Crawford *et al.*,1982 ; Ta and Weiland, 1992). Some researchers (Cliquet *et al.*,1990, Friedrich et al.,1979; Swank *et al.*, 1982) have also reported that the vegetative tissues, particularly stalk, serves as a reservoir of both carbohydrates and reduced nitrogen for remobilization during the final stages of grain development. Furthermore, we found that vegetative tissues exhibited a greater decrease of nitrogen content during reproductive growth as compared to dry weight. This is because nitrogen metabolism could have a greater effect on kernel set and grain yield than carbon metabolism (Below *et al.*,1981). However, the pattern of nitrogen content among plant parts particularly stalk at dry regime was quite different as compared to wet regime (Figure 22-23). The nitrogen accumulation in stalk for dry plot reached the peak at R_1 and then sharply declined to R_4 and increased again until maturity. This is because the stalk served either as a temporary storage organ for assimilate produced in excess of anabolic requirements during the first 2 to 3 weeks postsilking, or as an active sink whose relative capacity to attract assimilate declines during the latter part of the grain-filling period (Tollenaar, 1977).

Tassel and silk have the same patterns of dry weight and nitrogen content. They began at R_1 and then continued to decline during kernel-fill until maturity. Husk and cob were sharply increased in dry weight and nitrogen accumulation from R_1 to R_4 and gradually decreased thereafter, except the dry weight accumulation of cob at high nitrogen levels had steadily increased until harvest. Cliquet *et al.* (1990) reported that husks, shank, cob initially served as a sinks for nitrogen and then as a sources during the reproductive phase.

The patterns of dry weight and nitrogen accumulation in kernels exhibited quite different(Figure 20-23). Dry weight accumulation of all genotypes at both moisture regimes in both nitrogen levels occurred at R_1 and then greatly increased from R_4 to R_6 (maturity) whereas, the pattern of total nitrogen content were quite different. Total nitrogen content at high nitrogen showed the same pattern as dry weight; whereas, those at low nitrogen sharply decreased during kernel-fill period (R_4 to R_6). This result was probably due to the accelerated in leaf senescence during maturity, resulting in an increase nitrogen loss under nitrogen starvation (Wolfe *et al.*, 1988).

Among the three genotypes, SW 3601 grown under high nitrogen level showed significantly greater biomass and nitrogen content in kernels during kernel filling stage (R_4 to R_6) in both wet and dry regimes as compared to NSX 9210 and NS 1 genotypes. Under dry and low nitrogen conditions, this genotype also produced the highest biomass and nitrogen content in kernels during kernel filling period.

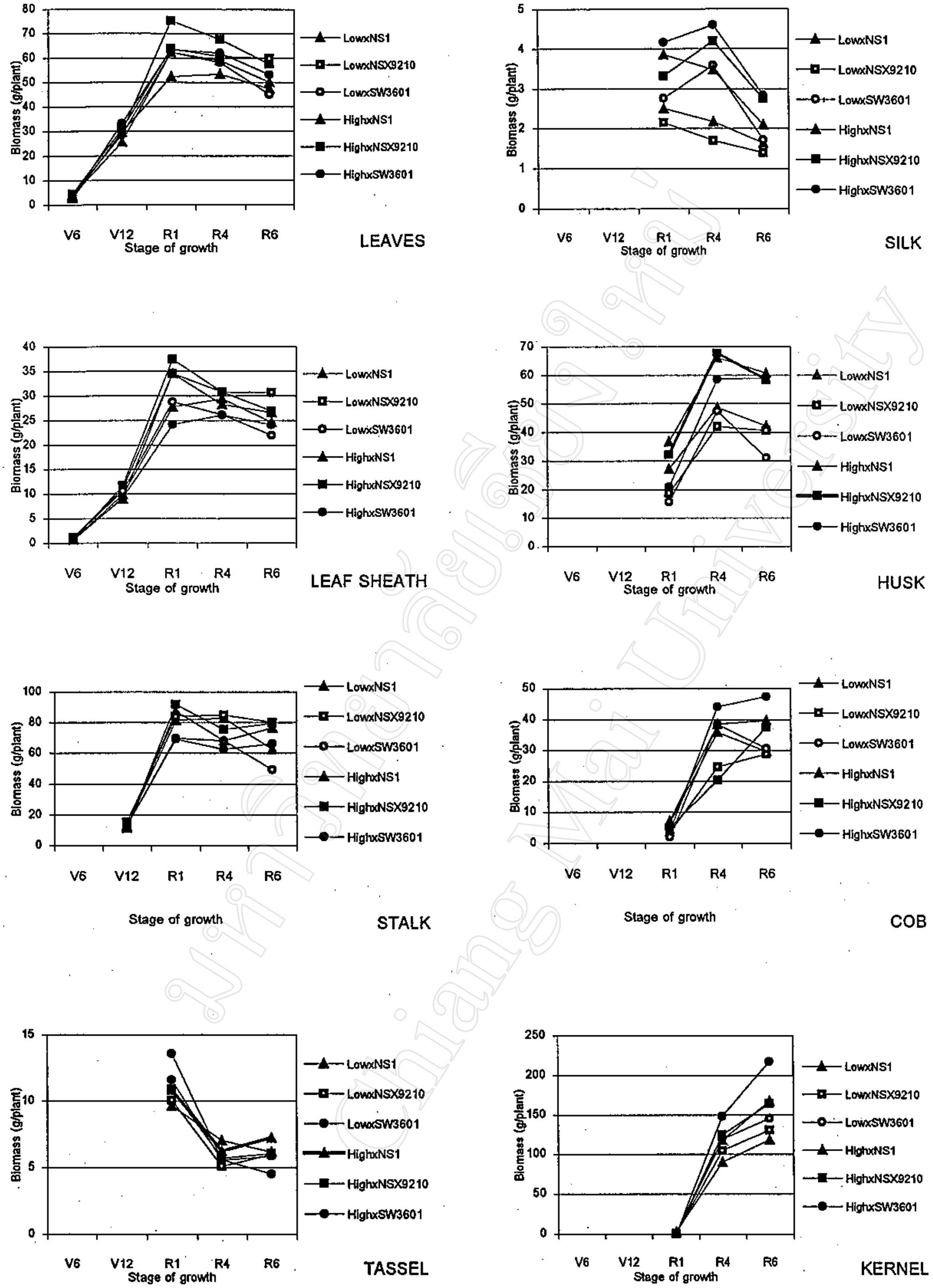

Figure 20 Biomass in each plant parts of 3 maize genotypes under low and high nitrogen in wet regime in 1998.

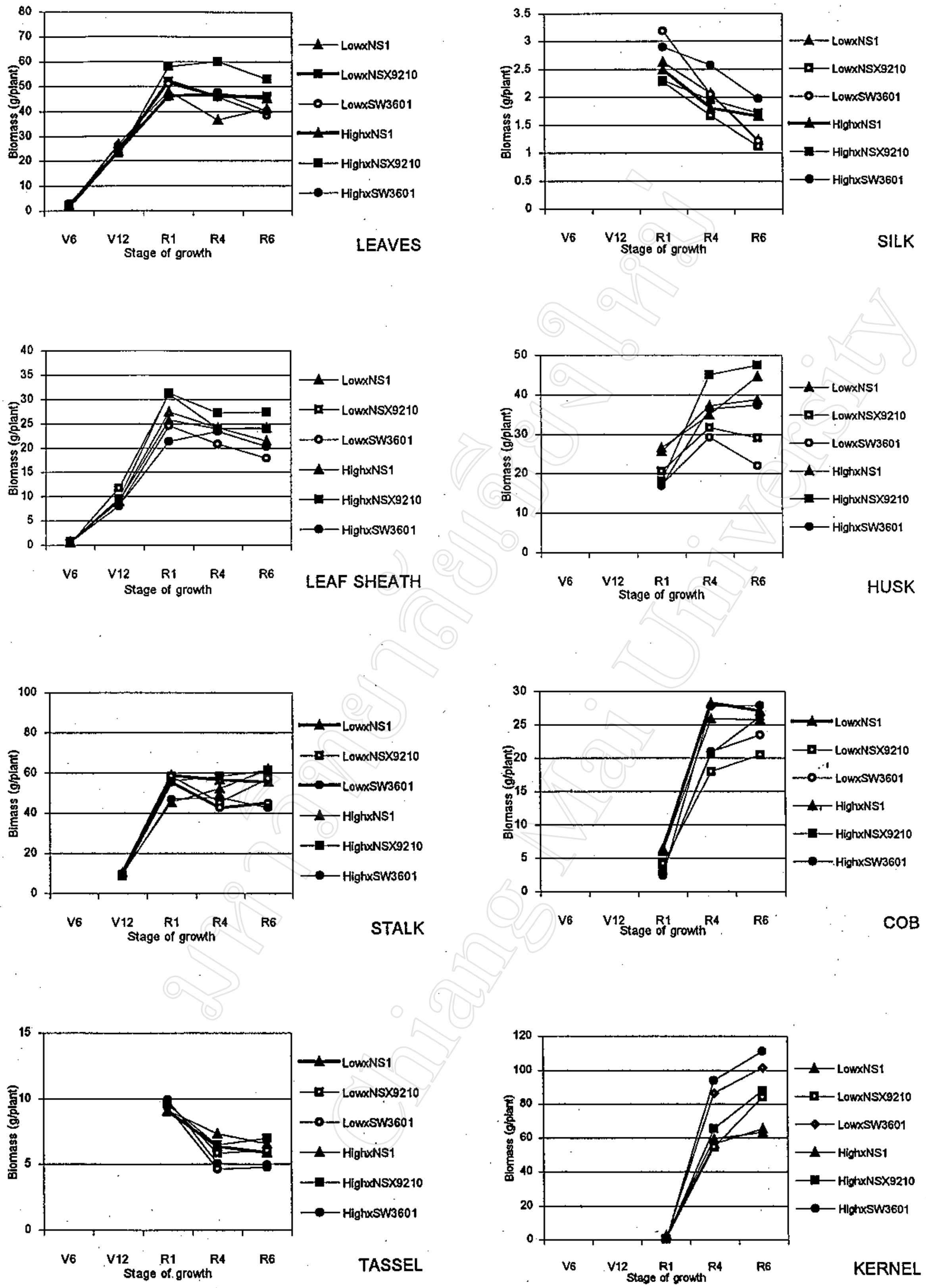

Figure 21 Biomass in each plant parts of 3 maize genotypes under low and high nitrogen in dry regime in 1998.

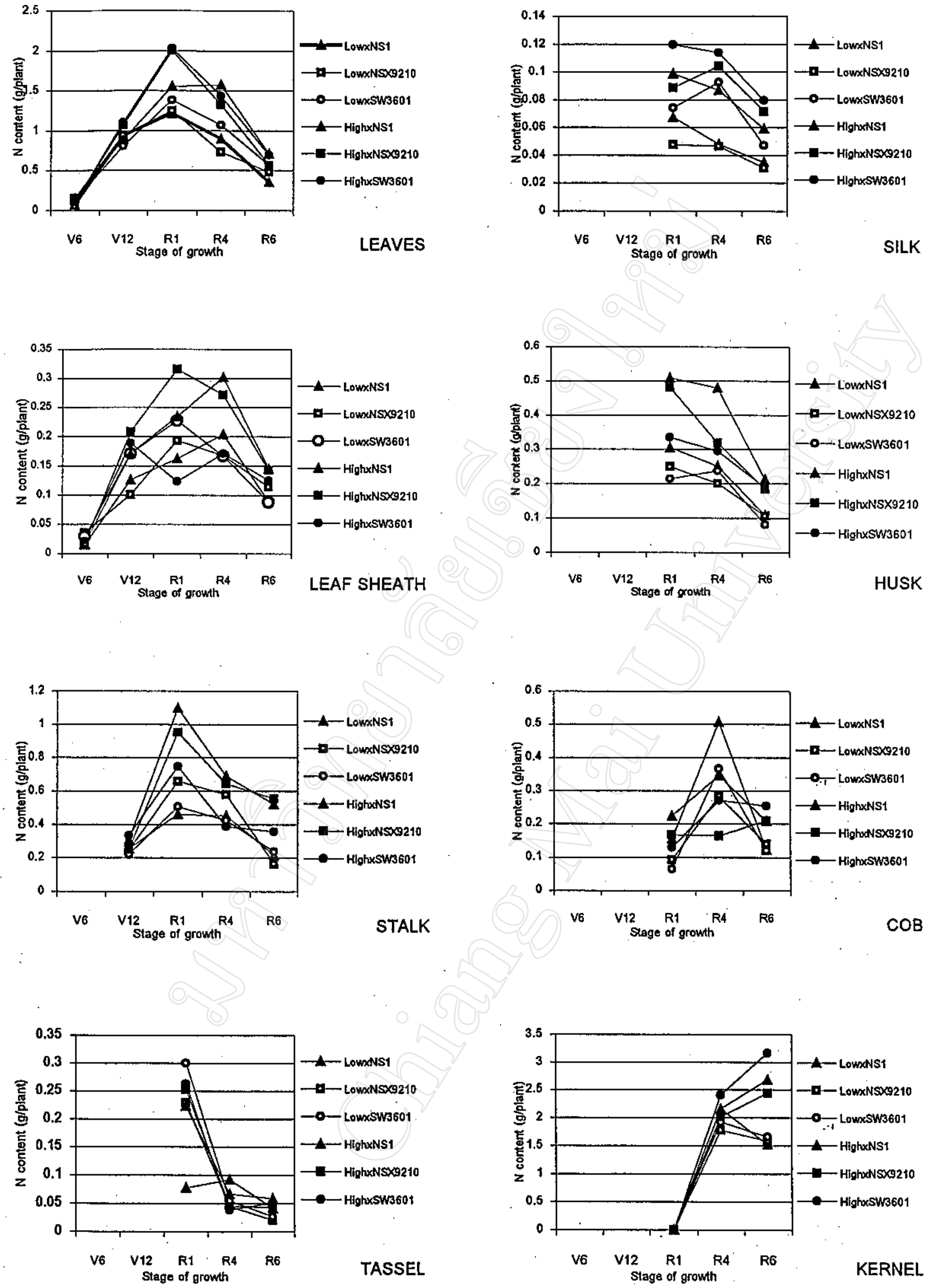

Figure 22 Total nitrogen content in each plant parts of 3 maize genotypes under low and high nitroge in wet regime in 1998.

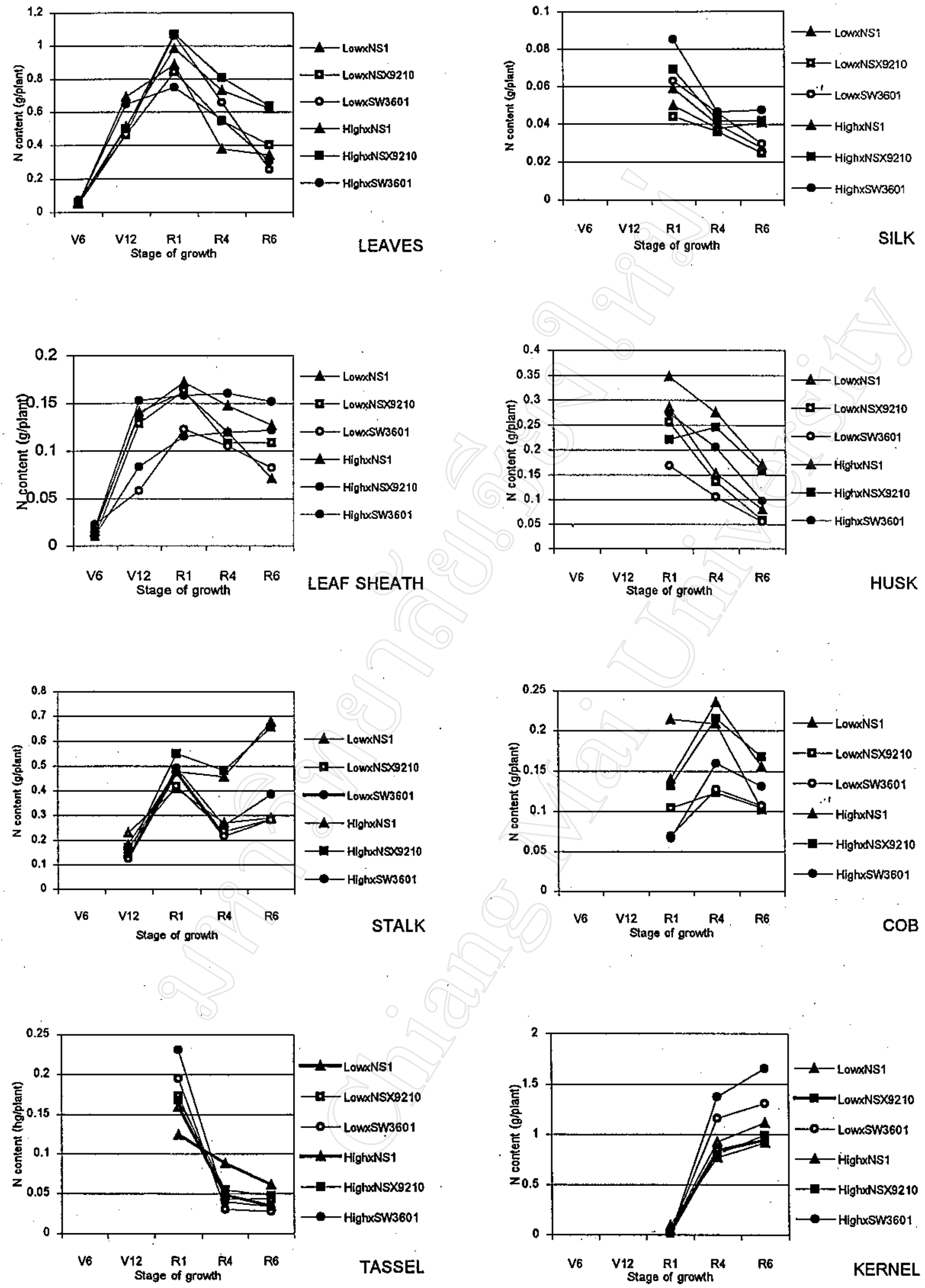

Figure 23 Total nitrogen content in each plant parts of 3 maize genotypes under low and high nitrog in dry regime in 1998.

Dry Matter and Nitrogen Partitioning

Percent of total dry matter and nitrogen content in maize increased with increasing the stage of growth and reached the peak at R_4 and then gradually declined until maturity (R_6) in both water regimes and nitrogen levels (Figure 24-27). During vegetative growth stage, vegetative tissues in terms of stalk, leaves and leaf sheath were accumulated and serves as a reservoir of both carbohydrates and reduced nitrogen for remobilization during the reproductive phase (Below, 1997; Uhart and Andrade, 1995). I found that the leaves served as a major sink of total dry weight and nitrogen uptake during the vegetative growth (V_6-V_{12}) followed by stalk and leaf sheath. The growing point and tassel was above the soil surface and the stalk began a period of greatly increased elongation at V_6 (Ritchie and Hanway, 1984). Percent of total dry weight and nitrogen content among vegetative tissues increased with increasing the stage of growth at vegetative growth (V_6 -V_{12}) and reached the peak at R_1 and then gradually declined until maturity (R_6). After anthesis, these percentages decreased as reproductive tissues became stronger sinks for photosynthates and nitrogen. Below (1997) also reported that when adequate levels of nitrogen is available, current assimilate is the major source for early kernel growth, however, when the supply of soil nitrogen is low, remobilization can become a major source of nitrogen for ear development. Some studies have been reported (Ta and Weiland, 1992) an earlier remobilization of nitrogen from stalk than leaves. While percent of total dry weight and nitrogen content in reproductive tissues particularly kernel sharply increased from R_1 to R_6 (maturity) in both water regimes and nitrogen levels. Dry weight and nitrogen uptake in the cob plus silk reached the peak at R_4 and then decreased until harvest; whereas, the percentage of total dry weight and nitrogen content in the husk was quite different. After anthesis, percent of total nitrogen content in husk gradually decreased from R_1 to R_6; whereas, the percentage of total dry weight were increased from R_1 to

R_4 and rapidly declined thereafter. Husk served as the source of current photosynthate during kernel-fill became a stronger source for kernel development (Tollenaar, 1977).

SW 3601 genotype had the highest percentage of total dry weight in kernel in both low and high fertilities (39.6 and 45.7 % for wet regime and 39.9 and 39.0 % for dry regime, respectively) as compared to NSX 9210 and NS 1 genotypes (Figure 24-25). SW 3601 genotype also produced the greatest percentage of total nitrogen content in kernel in both nitrogen levels (44.3 and 61.8 % for wet regime and 53.9 and 59.6 % for dry regime, respectively) when compared with NSX 9210 and NS 1 (Figure 26-27). SW 3601 genotype produced the highest dry matter yield and have a greater nitrogen partitioning from vegetative tissues to kernels more than NSX 9210 and NS 1 genotypes. This result was probably due to the greater remobilized of carbohydrate and reduced nitrogen from vegetative tissue to kernel in both nitrogen fertilities. Fischer and Palmer (1983) reported that in tropical maize, an improved balance between source supply and sink demand has been shown to be an essential step to increasing grain yields

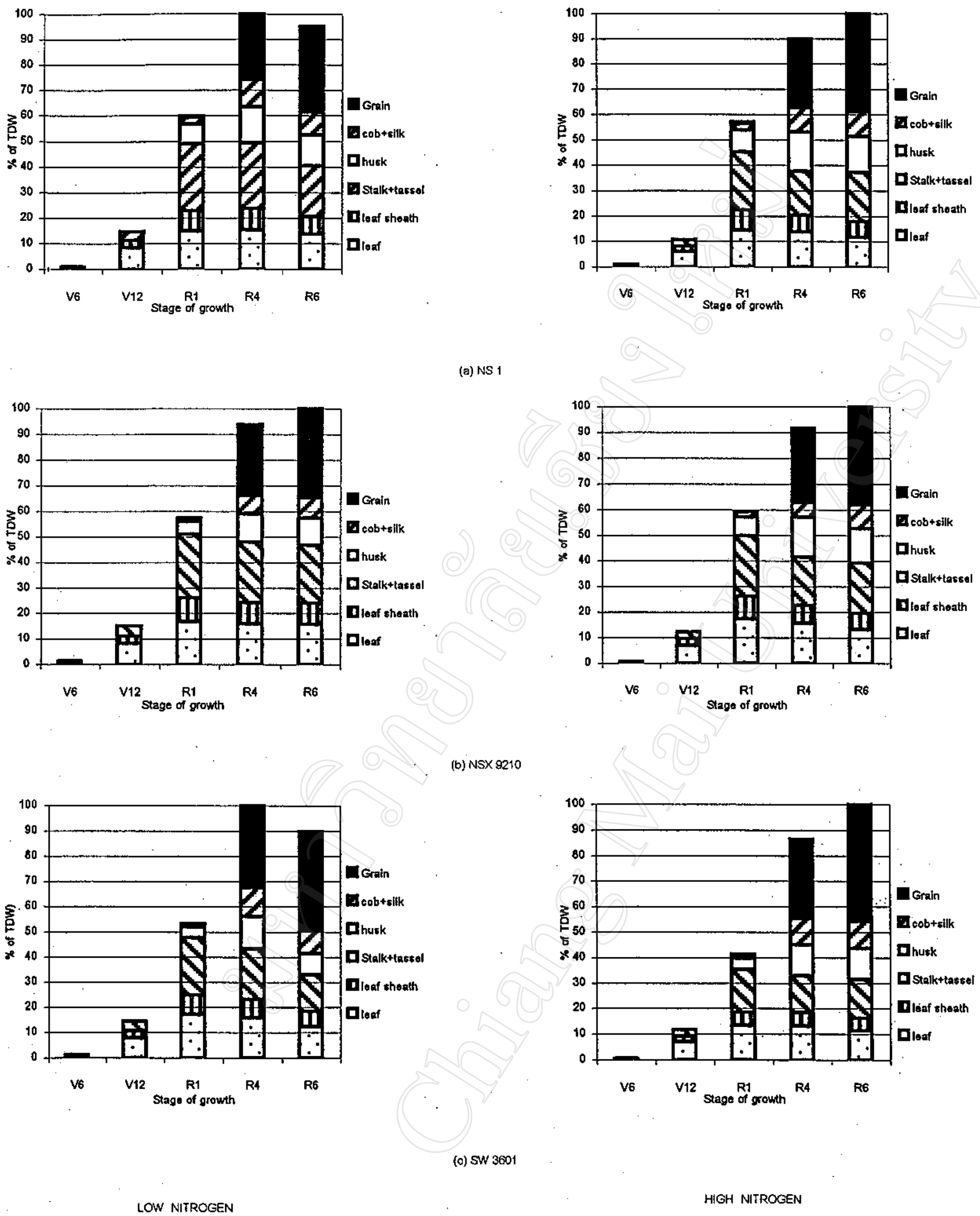

Figure 24 Percent of total dry weight in different plant parts of three maize genotypes : (a) NS 1 (b) NSX 9210 (c) SW 3601, at low and high nitrogen application under wet regime in 1998.

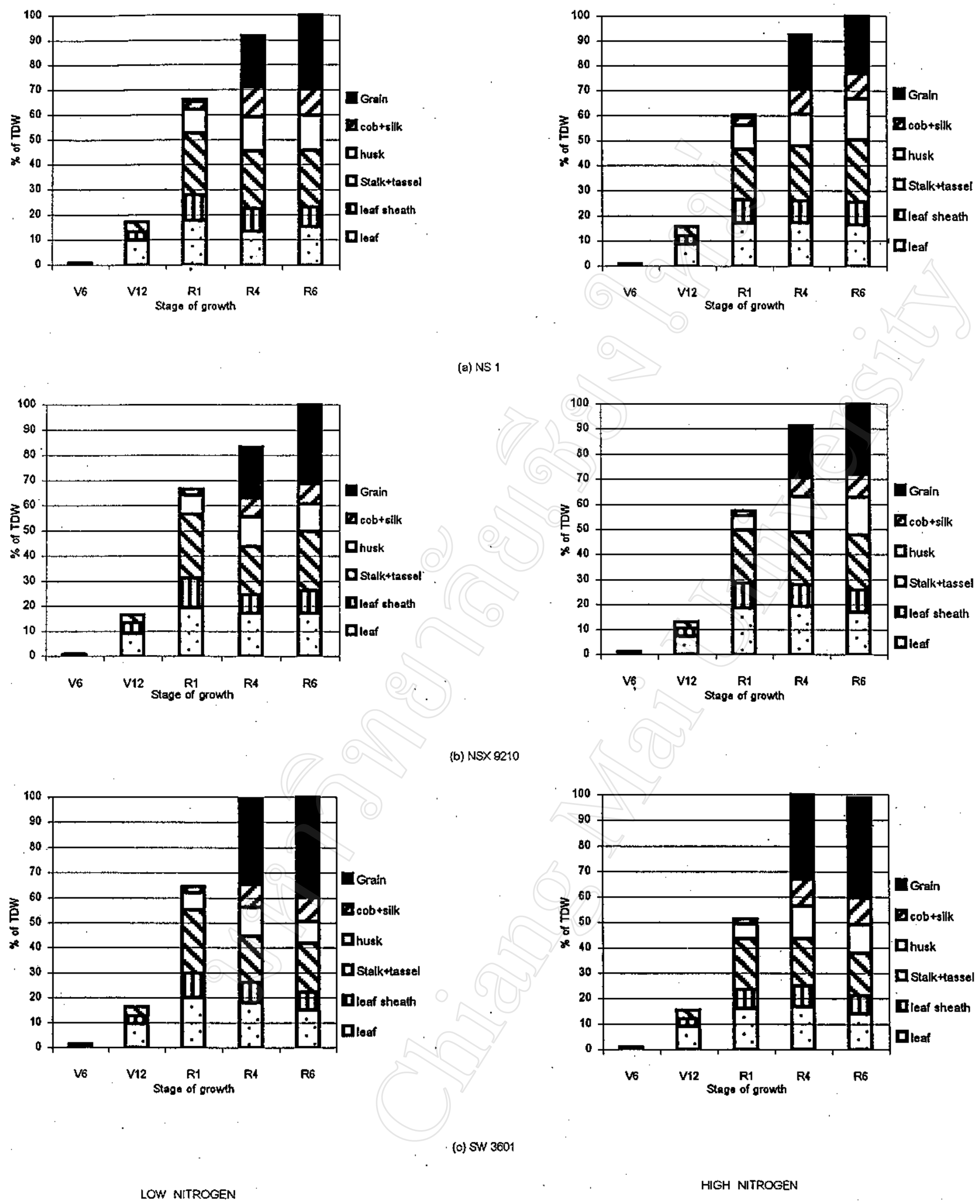

Figure 25 Percent of total dry weight in different plant parts of three maize genotypes : (a) NS 1 (b) NSX 9210 (c) SW 3601, at low and high nitrogen application under dry regime in 1998.

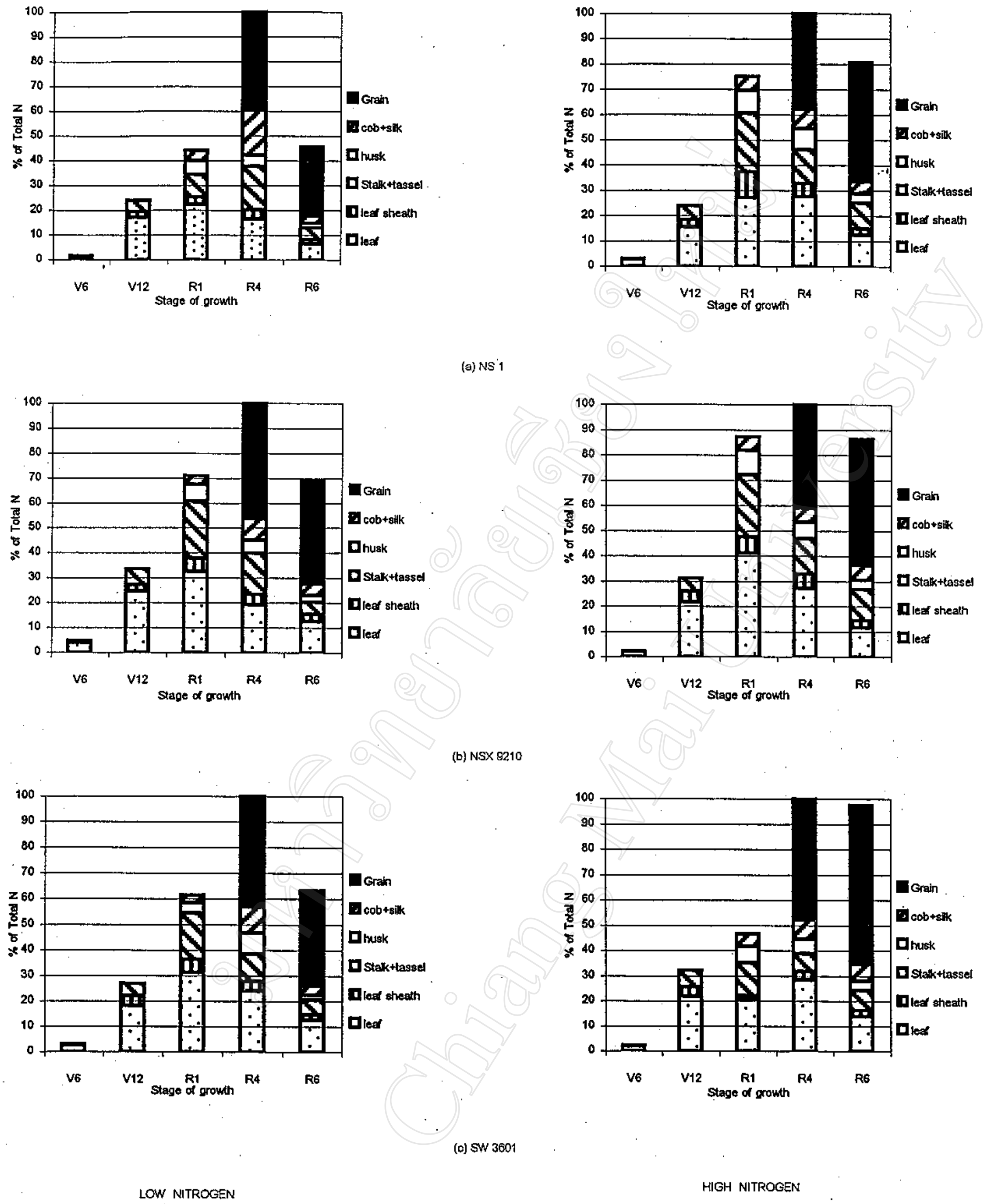

Figure 26 Percent of total nitrogen in different plant parts of three maize genotypes : (a) NS 1 (b) NSX 9210 (c) SW 3601, at low and high nitrogen application under wet regime in 1998.

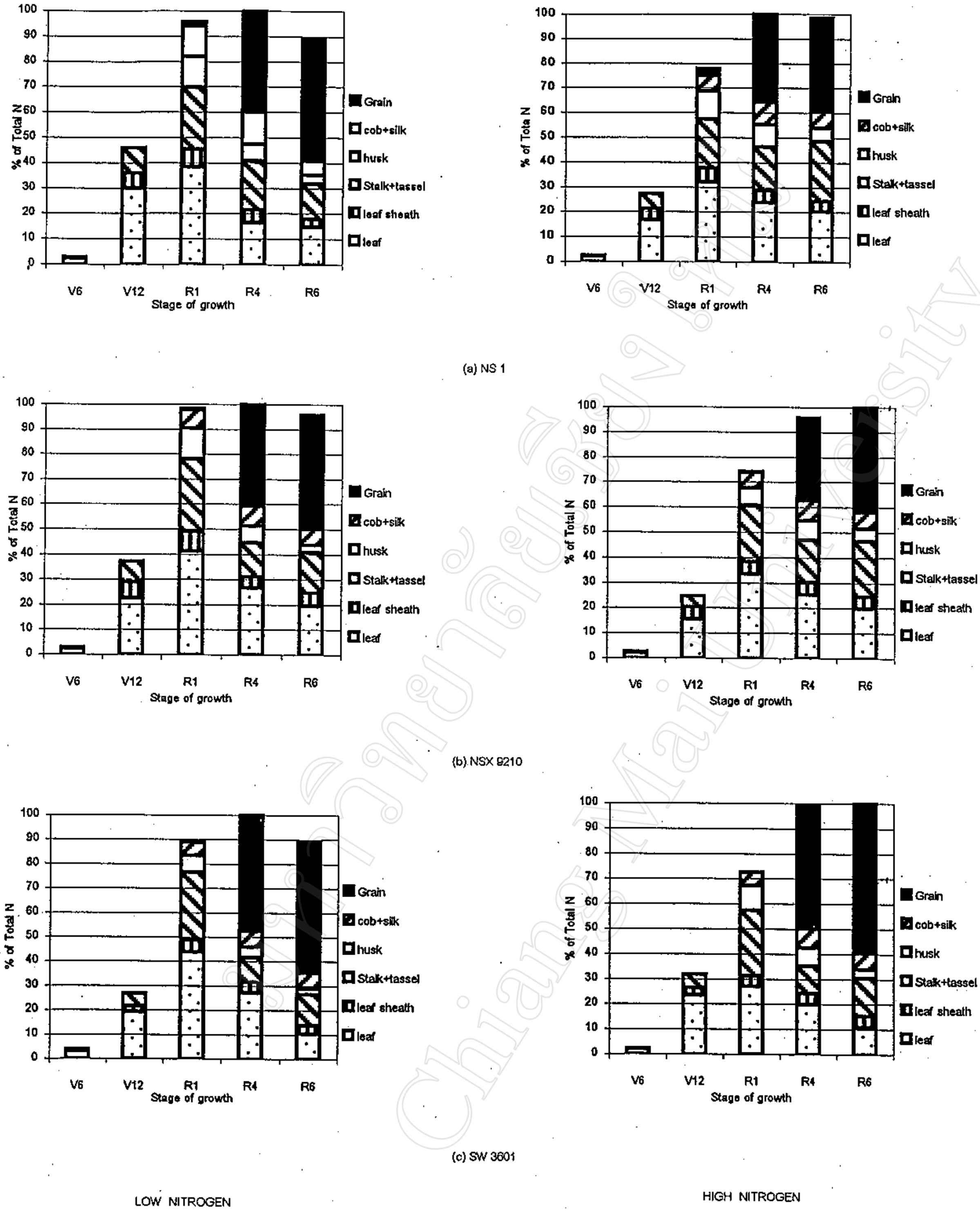

Figure 27 Percent of total nitrogen in different plant parts of three maize genotypes : (a) NS 1 (b) NSX 9210 (c) SW 3601, at low and high nitrogen application under dry regime in 1998.

Nitrogen Use Efficiency

Nitrogen use efficiency of three maize genotypes grown under different soil moisture and nitrogen levels during 1998-1999 are presented in Table 15. Water use efficiency in all three genotypes reduced with increased water stress in both years but the reduction was greater in 1998 than in 1999 due to the variation in weather conditions (Figure 2). All genotypes at low nitrogen fertility exhibited greater nitrogen use efficiency than those at high nitrogen level in both years. Among the three genotypes, SW 3601 produced the greatest nitrogen use efficiency as compared to the NSX 9210 and NS 1 genotypes (Table 14). Moll *et al.* (1987) also reported that higher-yielding hybrids of maize were expected to have a higher value of nitrogen use efficiency. The hybrid which could effective utilize addition nitrogen supplies, would be the more efficient and would have the higher yield over a wild range of nitrogen supplies (Moll *et al.*, 1982).

Table 15 Nitrogen use efficiency of maize** genotypes under different nitrogen levels for Experiment 3 in 1998-1999.

Nitrogen Level	Maize genotype	Moisture regime 1	2	3	4	5
				1998		
Low	NS 1	91.5 c*	75.4 de	71.7 ef	59.6 fg	32.9 hij
	NSX 9210	88.2 cd	88.3 cd	87.1 cd	66.0 efg	34.1 hij
	SW 3601	110.0 ab	110.9 ab	113.8 a	97.2 bc	56.0 g
High	NS 1	36.4 hi	32.1 hij	31.3 hij	22.6 i-l	10.6 l
	NSX 9210	38.2 hi	33.4 hij	32.2 hij	26.5 h-k	12.3 kl
	SW 3601	41.4 h	39.5 h	37.1 hi	34.1 hij	19.5 jkl
				1999		
Low	NS 1	58.5 cd	49.7 def	50.8 de	44.0 efg	35.7 g-j
	NSX 9210	70.9 ab	70.5 ab	73.1 a	63.5 bc	44.1 efg
	SW 3601	76.8 a	75.8 a	79.4 a	74.2 a	57.6 cd
High	NS 1	37.1 g-j	33.7 hij	33.4 hij	35.2 g-j	23.8 k
	NSX 9210	41.9 e-h	38.4 g-j	38.7 g-j	36.2 g-j	29.8 jk
	SW 3601	41.0 fgh	39.9 ghi	39.1 g-j	40.2 f-i	30.5 ijk

C.V. = 18.0 % (1998), 12.3 % (1999)

* Values followed by the same letter are not significantly different at the 5% level of probability using DMRT

**Nitrogen use efficiency was defined as kernel produced (kg/ha) per kg of nitrogen supplied.

Effect of water and nitrogen deficits on yield of maize genotypes

Kernel yield in all three genotypes at low and high nitrogen levels decreased with increased water stress in both years (Table 16) but the reduction was greater in 1998 than in 1999 due to the variation in weather (Figure 2). Furthermore, all genotypes grown under high nitrogen fertility produced higher kernel yield as compared to low nitrogen fertility in all moisture regimes in both years. However, this interaction was significantly in the field situation when stress intensity gradually increased during the growing season. Power (1983) reported that under dry soil conditions severely reduced the supply of mobile ions (nitrate) to roots, and impeded transformation of soil nutrients to plant-available form.

Among the three genotypes, SW 3601 showed the least drought susceptibility at low and high nitrogen levels in both years as compared to NSX 9210 and NS 1. SW 3601 genotype also showed the most drought tolerance under low and high nitrogen levels in both years (DI > 1) whereas NS 1 was the most drought susceptible genotype and NSX 9210 performed as the moderate drought tolerance genotype.

It can be concluded that SW 3601 genotype showed the most drought tolerance under low and high nitrogen supplies in both years (1998-1999) due to the least value of DSI (39.3 and 39.8 %) and the highest of DI (1.14 and 1.14). While NS 1 was the most drought susceptible (DSI = 54.2 and 53.3% and DI = 0.86 and 0.88) and NSX 9210 produced the DSI value of 50.9 and 47.4% and DI of 0.93 and 0.98 (Table 16). Senthong and Pandey (1998) reported that cowpea genotypes in terms of medium and indeterminate types showed the less value of DSI had greater seed yield and tolerated greater water stress than the early and determinate types.

Table 16. Effect of moisture regimes on kernel yield (kg/ha) of three maize genotypes under different nitrogen levels for Experiment 3 in 1998 and 1999.

Nitrogen Level	Maize genotype	Moisture regime 1	2	3	4	5	DSI	DI
				1998				
Low	NS 1	5721 c-i*	4711 g-k	4480 h-k	3721 kl	2058 lmn	64.0	0.92
	NSX 9210	5511 d-i	5521 d-j	5443 e-g	4125 jk	2128 mn	61.4	0.98
	SW 3601	6898 a-e	6930 a-e	7110 a-d	6075 b-g	3503 klm	49.2	1.30
High	NS 1	6836 a-e	6017 b-h	5856 b-h	4235 ijk	1990 n	70.9	0.74
	NSX 9210	7158 abc	6267 a-g	6072 b-g	4961 f-k	2303 lmn	67.8	0.82
	SW 3601	777 1a	7415 ab	6964 a-e	6369 a-f	3649 kl	53.0	1.20
				1999				
Low	NS 1	3655 jkl	3105 klm	3172 klm	2749 lm	2232 m	38.9	0.89
	NSX 9210	4430 ij	4405 ij	4568 hij	3969 ijk	2755 lm	37.8	0.90
	SW 3601	4803 ghi	4736 ghi	4965 ghi	4636 hij	3600 jkl	25.0	1.09
High	NS 1	6959 a-d	6319 c-f	6270 def	6600 b-e	4457 ij	35.9	0.93
	NSX 9210	7855 a	7203 a-d	7251 a-d	6796 a-d	5588 fgh	28.8	1.03
	SW 3601	7685 a	7488 ab	7325 abc	7533 ab	5716 efg	25.6	1.08
				1998 & 1999				
Low	NS 1	4688 c-g	3908 d-g	3826 d-g	3235 fg	2145 h	54.2	0.86
	NSX 9210	4971 b-f	4963 b-f	5005 b-f	4047 d-g	2441 g	50.9	0.93
	SW 3601	5851a-e	5833 a-e	6037 a-e	5356 a-f	3551 efg	39.3	1.14
High	NS 1	6897 abc	6168 a-d	6063 a-e	5417 a-f	3223 fg	53.3	0.88
	NSX 9210	7506 ab	6735 abc	6661 abc	5879 a-e	3945 d-g	47.4	0.98
	SW 3601	7728 a	7451 ab	7145 abc	6965 abc	4682 c-g	39.8	1.14

C.V. (%) = 18.0 (1998), 12.2 (1999); 19.8 (1998&1999)

* Values within a column followed by the same letter are not significantly different at the 5% level of probability using DMRT

Effect of water and nitrogen stresses on yield components of maize genotypes

Number of ears. The number of ears per square meter was decreased by decreased irrigation water application and nitrogen supply in all genotypes, but to a lesser degree when compared with kernel number and kernel weight in both years (Table 17-18). I found that ear number of all genotypes showed the largest response to nitrogen supply as compared to irrigation water application. At high nitrogen under water stress condition, all genotypes gave a lower of ear number than at low nitrogen supply. Among the three genotypes, SW 3601 exhibited the least response of ear number to water and nitrogen deficits as compared to NSX 9210 and NS 1 genotypes in both years. Bolaños and Edmeades (1996) stated that drought treatment was markedly reduced in the number of ears per plant of maize genotypes.

Number of kernels per ear Kernel number was the yield components most sensitive to water and nitrogen stress (Table 17-18). Kernel number of all genotypes grown under low nitrogen supply showed the larger response as compared to high nitrogen supply in both years. In 1998, kernel number of SW 3601, NSX 9210 and NS 1 in the driest treatment were 15.5, 22.5; 34.2 % under low nitrogen supply and 9.9, 19.6; 30.8 % under high nitrogen supply which was lower than those in the wettest regime (Table 17). While in 1999, kernel number of SW 3601, NSX 9210 and NS 1 in the driest treatment were 16.7, 20.7 ; 23.4% under low nitrogen supply and 3.9, 7.1 ; 11.9 % under high nitrogen supply which was lower than those in the wettest treatment (Table 18). The number of potential ovules that ultimately develop into mature kernels is further affected by the degree of pollination and by the extent of kernel abortion (Below, 1997). A greater reduce of kernel number as affected by drought and nitrogen stress in both years was probably due to delayed silking resulting in an increase in the length of the ASI as the results of water stress (Bolaños and Edmeades, 1993b) and nitrogen deficiencies (Girardin *et al.,* 1987). Lack of nitrogen enhances kernel abortion have also been reported (Below, 1997 ; Pearson and Jacobs, 1987 ; Mozafar, 1990 ; Uhart and Andrade, 1995b).

Kernel weight. Kernel weight was also increased by irrigation water application and have the same degree when compared with kernel number (Table 17-18). However, individual kernel weight was less affected by drought than kernels per plant (Bolaños and Edmeades, 1996). I also found that kernel weight of all genotypes grown under low nitrogen supply gave the same degree of water stress (DSI value) as compared to high nitrogen supply in 1998 whereas in 1999, those grown under high nitrogen supply showed a greater the value of DSI than under low ntrogen. In 1998, kernel weight of SW 3601, NSX 9210 and NS 1 genotypes in the driest plot were 17.3, 22.8; 25.8 % under low nitrogen and 18.1, 20.8; 18.1 % under high nitrogen supply which was lower than in the wettest treatment (Table 17). While in 1999, kernel weight of SW 3601, NSX 9210 and NS 1 in the driest plot were 3.4, 6.3; 8.6 % under low nitrogen and 12.3, 12.9; 13.0 % under high nitrogen which was lower than in the wettest regime (Table 18). The weight of individual kernels was a function of the kernel number and the assimilate supply during kernel-fill, increase in individual kernel weight due to nitrogen supply have been reported (Lemcoff and Loomis, 1986 ; Pearson and Jacobs, 1992).

Table 17 Effect of moisture regimes on yield components of three maize genotypes under different nitrogen levels for Experiment 3 in 1998.

Nitrogen Level	Maize genotype	Moisture regime 1	2	3	4	5	DSI
		total ear number/m^2					
Low	NS 1	5.62b-e*	5.44de	5.33e	5.40e	5.33e	5.2
	NSX 9210	5.51cde	5.40e	5.40e	5.40e	5.40e	2.0
	SW 3601	5.44de	5.44de	5.44de	5.40de	5.33e	2.0
High	NS 1	5.88a-d	5.55b-e	5.62b-e	5.55b-e	5.28e	10.2
	NSX 9210	6.28a	6.06ab	5.93a-d	5.95a-d	5.77a-e	8.1
	SW 3601	5.77a-e	5.44de	5.44de	5.54de	5.33e	7.6
		kernel number/ear					
Low	NS 1	540ab	477a-e	471a-e	449b-e	355f	34.2
	NSX 9210	510a-d	503a-d	502a-d	486a-e	395ef	22.5
	SW 3601	526abc	520abc	516abc	513a-d	444cde	15.5
High	NS 1	545ab	494a-d	484a-e	462a-e	377ef	30.8
	NSX 9210	520abc	506a-d	511a-d	489a-d	418def	19.6
	SW 3601	557a	546a	543ab	525abc	502a-d	9.9
		100 kernel weight (g)					
Low	NS 1	26.6c-h	26.4c-h	24.9f-k	24.7g-k	22.6kl	25.8
	NSX 9210	25.0d-k	25.0e-k	23.9h-k	22.5kl	19.3m	22.8
	SW 3601	27.6a-f	28.0a-e	28.0a-e	26.9c-h	22.8jkl	17.3
High	NS 1	28.3abc	28.0a-e	26.8c-h	26.0c-i	22.1kl	21.9
	NSX 9210	25.5c-j	26.0c-i	25.6c-j	22.9jkl	20.2lm	20.8
	SW 3601	30.3a	29.8ab	30.7a	27.9a-f	24.8g-k	18.1

C.V. (%) = 4.8% (ear number), 13.2 % (kernel number), 5.5% (kernel weight)

* Values within a column followed by the same letter are not significantly different at the 5% level of probability using DMRT

Table 18 Effect of moisture regimes on yield components of three maize genotypes under different nitrogen levels for Experiment 3 in 1999.

Nitrogen Level	Maize genotype	Moisture regime 1	2	3	4	5	DSI
		-------total ear number/m^2-------					
Low	NS 1	5.33fgh*	5.40e-h	5.44d-h	5.40e-h	5.17h	3.0
	NSX 9210	5.44d-h	5.40e-h	5.66b-h	5.62c-h	5.28gh	2.9
	SW 3601	5.33fgh	5.28gh	5.55c-h	5.44d-h	5.25fgh	1.5
High	NS 1	6.00a-d	5.66b-h	5.77a-g	5.77a-g	5.17h	13.8
	NSX 9210	6.22a	6.06abc	6.15ab	5.95a-e	5.88a-f	5.5
	SW 3601	5.70a-g	5.66b-h	5.63b-h	5.66b-h	5.55c-h	2.6
		-------kernel number/ear-------					
Low	NS 1	422b-f	375e-h	373e-h	366fgh	323h	23.4
	NSX 9210	448a-d	426b-f	423b-f	408c-g	355gh	20.7
	SW 3601	453a-d	435a-e	424b-f	424b-f	377e-h	16.7
High	NS 1	462a-d	457a-d	452a-d	456a-d	407d-g	11.9
	NSX 9210	494a	487ab	486ab	483ab	459a-d	7.1
	SW 3601	486ab	483ab	474abc	470a-d	467a-d	3.9
		-------100 kernel weight (g)-------					
Low	NS 1	26.7fgh	26.7fgh	26.8fg	26.2fgh	24.4ij	8.6
	NSX 9210	23.8jk	23.5jk	22.9kl	21.7lm	22.3m	6.3
	SW 3601	26.1fgh	26.0fgh	26.0fgh	25.6ghi	25.2hi	3.4
High	NS 1	33.0a	32.5ab	30.6cd	30.0de	28.7e	13.0
	NSX 9210	27.1f	27.4f	27.4f	25.2hi	23.6jk	12.9
	SW 3601	31.6bc	31.2cd	30.5cd	30.3cde	27.7f	12.3

C.V. (%) = 6.3 % (ear number), 8.7 % (kernel number), 3.9 % (kernel weight)

* Values within a column followed by the same letter are not significantly different at the 5% level of probability using DMRT