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Evaluation of Quality Protein Maize (QPM) and Normal Maize for Growth Performance of Crossbred Piglets in Western Hills of (Nepal)

By M.R. Tiwari, P.B. Chapagain, M.K. Shah & Y.K. Shrestha

Regional Agricultural Research Station, Lumle, Kaski

Abstract - The pig population of the country is estimated to be 1.1 million and producing 17923 MT meats per annum. The pig farming constitutes the livelihood of rural poor belonging to the lowest socio economic strata and they have no means to undertake scientific pig farming with improved stock, proper housing, feeding and management. Maize is a primary source of energy supplement and can contribute up to 30 percent protein, 60 percent energy and 90 percent starch in animal's diet. About 70- 80 percent of maize production is used as a feed ingredient in the world. QPM is high in energy, low in fiber, and contains approximately 9-12% crude protein with two essential amino acids lysine and tryptophan. Pigs and chicken raised on QPM attained body weight at roughly twice the rate of animal fed with normal maize. Therefore, a study was carried out on growing crossbred male piglets (Landrace x Yorkshire) piglets of 35 days old with body weight of 8 kg at Regional Agricultural Research Station, Lumle, Kaski for 150 days to compare the growth performance of piglets fed with QPM and normal maize.

Keywords : quality protein maize, pigs, feeding, Nepal.

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Evaluation of Quality Protein Maize (QPM) and Normal Maize for Growth Performance of Crossbred Piglets in Western Hills of (Nepal)

M.R. Tiwari ^α, P.B. Chapagain ^σ, M.K. Shah ^ρ & Y.K. Shrestha ^ω

Abstract - The pig population of the country is estimated to be 1.1 million and producing 17923 MT meats per annum. The pig farming constitutes the livelihood of rural poor belonging to the lowest socio economic strata and they have no means to undertake scientific pig farming with improved stock, proper housing, feeding and management. Maize is a primary source of energy supplement and can contribute up to 30 percent protein, 60 percent energy and 90 percent starch in animal's diet. About 70- 80 percent of maize production is used as a feed ingredient in the world. QPM is high in energy, low in fiber, and contains approximately 9-12% crude protein with two essential amino acids lysine and tryptophan. Pigs and chicken raised on QPM attained body weight at roughly twice the rate of animal fed with normal maize. Therefore, a study was carried out on growing crossbred male piglets (Landrace x Yorkshire) piglets of 35 days old with body weight of 8 kg at Regional Agricultural Research Station, Lumle, Kaski for 150 days to compare the growth performance of piglets fed with QPM and normal maize. Piglets were allocated into two groups having six piglets in each group by using Complete Randomized Design (CRD). Two types of concentrate mixture were prepared for piglets; starter (18% CP) and grower (16% CP). Piglets of T1 were provided adlib amount of normal maize included concentrate mixture whereas piglets of T2 received QPM included concentrate mixture in adlib amount. Concentrate mixture was provided to the piglets of both groups twice a day for both periods (starter-60 days and grower-90) of experiments. Experiment of 150 days revealed that average feed intake of T2 was higher (1.65kg/day/piglet) than T1 (1.48kg/day/piglet), however, it was not significant ($P>0.05$), between diet groups. Furthermore, total dry matter intake was higher in T2 (235.12 kg) than T1 (210.9 kg) whereas, feed conversion ratio (FCR) per kg live weight gain was higher for T2 (3.26:1 kg) than T1 (2.6:1 kg) which was not significant ($P>0.05$) between diet groups. Similarly, total body weight gain of experimental piglets was recorded higher in T1 (80.92 kg) than T2 (72.2 kg) which was also non-significant ($P>0.05$) between diet groups. Average daily gain of piglets was 571 and 511.0g for T1 and T2, respectively.

Keywords : quality protein maize, pigs, feeding, Nepal.

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I. INTRODUCTION

The pig population of the country is estimated to be 1.1 million and producing 17923 MT meats per annum, that accounts 4.75% of total livestock population and 6.45 % of total meat production of the country (MOAC, 2010/11). The pig farming constitutes the livelihood of rural poor belonging to the lowest socio economic strata and they have no means to undertake scientific pig farming with improved stock, proper housing, feeding and management. The importance of pig is highest feed conversion efficiency, can utilize wide range of feedstuffs, highly prolific with shorter generation interval, requires small investment on building and equipments and dressing percentage ranges 65-80% in comparison to other livestock species. Similarly, pork is most nutritious with high fat and low water content and has better energy value than that of other meats. It is rich in vitamins like thiamin, niacin and riboflavin. Moreover, pig farming provides quick return since the marketable weight of fatteners can be achieved within a period of 6-8 months and has good demand in domestic as well as export markets for pig products such as pork, bacon, ham, sausages, lard etc.

In recent days, acceptance of pork consumption has been growing in the Nepalese society; therefore, rearing of pig and consumption of pork is not culture or religion dependent. Simultaneously, increased urbanization and individuals access to cross cultural environments has increased the acceptance of pork in almost all societies of the country (Dhauwadel and Ghimire, 2004). As the internal production is not sufficient to meet the demand of the nation, live pigs worth of NRs 470.26 million and frozen pork of worth NRs 327.02 million was imported during 2010/11 period (MOAC, 2010/11).

Maize is a primary source of energy supplement and can contribute up to 30 percent protein, 60 percent energy and 90 percent starch in animal's diet. About 70-80 percent of maize production is used as a feed ingredient in the world. Although, normal maize contains between eight and nine percent protein, the quantity of two essential amino acids (lysine and tryptophan) is below nutritional requirement for mono gastric animals. QPM possess balance of essential amino acids and can reduce the dietary inclusions of protein - rich

II. METHODOLOGY

a) Experimental Animals

The experiment was carried out on growing crossbred male piglets (Landrace x Yorkshire) at Regional Agricultural Research Station, Lumle, Kaski from 13 December 2011 to 13 May 2012 (068/8/28 to 069/1/28). The experimental piglets were procured from Livestock Farm, Lampatan, Pokhara, Kaski of about 35 days old with average body weight of 8.0 kg were allotted into two groups having six piglets in each group by using Complete Randomized Design (CRD). All experimental animals were drenched with Fenbendazole @ 5 mg/kg body weight against internal parasites and vaccinated with swine fever vaccine @ 1ml/kg body weight before putting in the experiment.

b) Diet Composition

Feed ingredients such as soybean cake, rice bran, normal maize, minerals, methionine and salt were procured from "Khowpa Feed Industries", Bhaktapur while QPM was bought from National Maize Research Program, Rampur, Chitawan. Two types of concentrate mixture were composed for experimental animal; starter (18% CP) and grower (16% CP) which are given in Table 1. Methionine was added in both concentrate mixture @ 100 g/100 kg of concentrate mixture.

Table 1 : Composition of concentrate mixture (in %)

Ingredients	Starter Ration		Grower Ration	
	Part	CP %	Part	CP %
Normal maize / QPM	50	3.94	50	3.94
Rice bran	16	1.42	22	1.95
Soy bean cake	32	12.68	26	10.30
Mineral	1	0	1	0
Salt	1	0	1	0
Total	100	18.04	100	16.19

c) Experimental Diet

Following diets were formulated to the experimental piglets (Table 2)

Table 2 : Experimental diets of the piglets

S/n	Treatment	Experimental Diets
1	1	Normal maize included concentrate mixture <i>adlib</i>
2	2	QPM included concentrate mixture <i>adlib</i>

d) Feeding Regime

Concentrate mixture feeding was done on group basis was provided to the piglets of both groups twice a day (morning and evening) in *adlib* amount for both periods (starter – 60 days and grower – 90 days) of the experiment. Quantity of concentrate mixture given daily to the piglets in groups weighed daily and refusal was weighed in the next morning. Drinking water was provided thrice a day in adequate amount.

e) Chemical Analysis

The samples of feed ingredients were sent to the Animal Nutrition Division, Khumaltar, Lalitpur for proximate analysis. Representative samples from offered concentrate mixture were analyzed for Dry Matter (DM), Crude Protein (CP), Crude Fibre (CF), Ether Extract (EE) and Ash contents (TA). The DM was determined by oven drying at 100°C for 24 hrs. Crude protein of the samples was determined using the Kjeldahl method. Ether extract was determined using

Soxhlet apparatus. Ash content was determined by ashing at 550°C in a muffle furnace for 16 hrs (AOAC, 1980). Crude Ether of the samples was determined using the Van Soest method (Goering, H.K. and Van Soest, 1970). Similarly, samples of normal maize and quality protein maize were sent to Food Lab of Agriculture Botany Division of NARC tryptophan and lysine content analysis. Tryptophan was analyzed as suggested by Hernandez H and Bates L.S. (1969) and Lysine as suggested by Doll H. and Koie B. (1975).

f) Data Measurement

The trial period consisted for 150 days (60 days starter and 90 days grower) after an adaptation period of 7 days. Total feed intake by the piglets in the group

was recorded daily for both experimental periods. The body weight gain of individual piglet was measured at biweekly interval in the morning before feeding.

g) Data Analysis

Data of feed intake and body weight gain were analyzed by "t" test for every measurement using statistical package Minitab 2003, versions 13.20.

III. RESULTS AND DISCUSSION

a) Chemical Composition of Feed Ingredients

The result of chemical analysis and amino acids content are given in Table 3.

Table 3 : Chemical composition of feed ingredients (% DM basis)

Ingredients	DM	OM	TA	CP	CF	EE
Normal maize	87.69	97.97	2.03	9	2.34	4.48
Quality protein maize (QPM)	89.36	97.62	2.38	9	6.26	5.12
Rice bran	87.85	89.5	10.5	10	4.83	5.1
Soybean cake	86.87	92.63	7.37	44	9.38	0.7

Comparison of nutritional composition of QPM and NM is given in Table 4 and figure 1.

Table 4 : Comparison of the nutritional composition of QPM and Normal maize (on dry basis)

Nutrient	Ortega, <i>et al.</i> , 1986		Osei <i>et al.</i> , 1999		Our analysis, 2012	
	NM	QPM	NM	QPM	NM	QPM
Crude Protein, %	9.8	9.8	8.92	9.11	9	9
Ether Extract, %	NA	NA	4.48	5.12	4.48	5.12
Crude Fibre, %	NA	NA	1.93	2.14	2.34	6.26
Organic matter	NA	NA	98.10	98.40	97.97	97.62
Ash, %	NA	NA	1.90	1.60	2.03	2.38
Lysine, %	0.27	0.43	0.24	0.32	0.19	0.28
Tryptophan, %	0.06	0.10	0.06	0.08	0.04	0.07

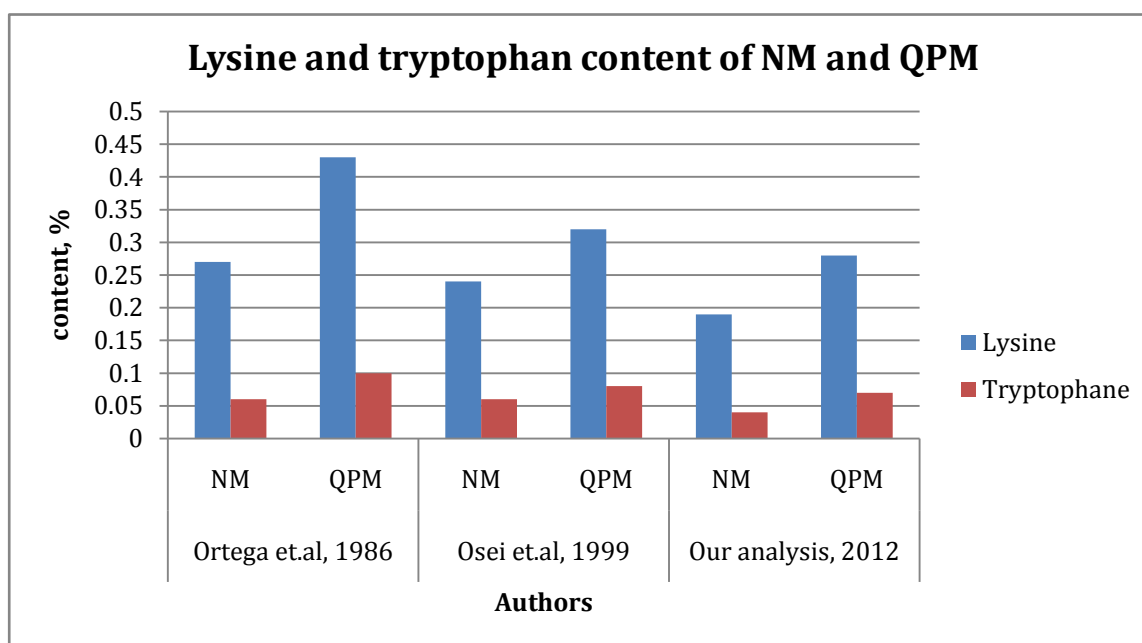


Figure 1 : Comparison of lysine and tryptophan content of QPM and normal maize

b) *Feed Intake*

Average daily intake of concentrate mixture by piglets for both experimental periods is given in Table 5.

Table 5 : Average feed intake of experimental piglet/day

Concentrate Mixture	(Mean $\pm$ SE)	
	T1	T2
Starter (60 days)		
Feed intake, kg	0.82 $\pm$ 0.11	0.83 $\pm$ 0.13
Average daily gain, g	291 $\pm$ 24.0	274.8 $\pm$ 30.0
Total Dry Matter Intake (DMI) per animal, kg	46.74	47.31
Feed Conversion Ratio (Feed: Gain), kg	2.45:1	2.86:1
Grower (90 days)		
Feed intake, kg	2.29 $\pm$ 0.35	1.74 $\pm$ 0.26
Average daily gain, g	688.0 $\pm$ 103	616 $\pm$ 127.0
Total Dry Matter Intake (DMI) per animal, kg	195.8	148.77
Feed Conversion Ratio (Feed: Gain), kg	3.16:1	2.68:1
Entire trial period (150 days)		
Feed intake, Kg	1.48 $\pm$ 0.34	1.65 $\pm$ 0.27
Average daily gain, g	571 $\pm$ 0.02	511 $\pm$ 0.01
Total Dry Matter Intake (DMI) per animal (150 days), kg	210.9	235.12
Feed Conversion Ratio (Feed: Gain), kg	2.6:1	3.26:1

Table 5 revealed that in starter period, piglets of T2 had higher feed intake (0.83 kg), total dry matter intake (47.31 kg) and FCR (2.86:1 kg) than that of T1 which were for feed intake (0.82 kg), total dry matter intake (46.74 kg) and FCR (2.45:1 kg) whereas average daily gain was higher in T1 (291 g) than that of T2 (274.8 g). Feed intake and average daily gain were not significant ($P>0.05$) between diet groups. Similarly, in grower period of experiment, there was noted higher feed intake (2.29 kg), average daily gain (688 g) and total dry matter intake (195.8 kg) and FCR (3.16:1) in T1 than that of T2 which were for feed intake (1.74 kg), average daily gain (616 g), total dry matter intake (148

kg) and FCR (2.68:1 kg). In this period, average daily gain was not significant ($P>0.05$) and feed intake was significant ($P<0.01$) between diet groups. Likewise, in 150 days of experiment, T2 was recorded higher in feed intake (1.65 kg), total dry matter intake (235.12 kg) and FCR (3.26:1 kg) than that of T1 that were for feed intake (1.48 kg), total dry matter intake (210.9 kg) and FCR (2.6:1 kg) whereas average daily gain was noted higher in T1 (571 g) than that of T2 (511 g).

c) *Growth Performance*

The growth performance of experimental piglets is given in Table 5 and Figure 2.

Table 5 : Growth performance of piglets (Mean $\pm$ SE)

Parameter	T1	T2
Initial Body weight, kg	8.08 $\pm$ 0.47	8.15 $\pm$ 0.37
Initial metabolic weight, kg	4.79	4.82
Final Body weight, kg	89.0 $\pm$ 3.67	80.17 $\pm$ 2.75
Final metabolic weight, kg	28.97	26.79
Total weight, gain, kg	80.92	72.02
Average daily gain, g	571 $\pm$ 0.02	511 $\pm$ 0.01

The initial body weight of experimental piglet of T1 and 2 was almost similar (8.08 and 8.15 kg) and reached 89.0 and 80.17 kg by the end of experiment (150 days) for T1 and 2, respectively. Both initial and final body weight was found to be not significant ($P>0.05$) between diet group. The highest body weight gain was recorded for T1 (80.92 kg) than that of T2 (72.02 kg). Similarly, highest average daily gain was observed for T1 (571 g) than that of T2 (511g), however,

it varied from 248 to 773 g for T1 and from 195 to 722 g in T2.

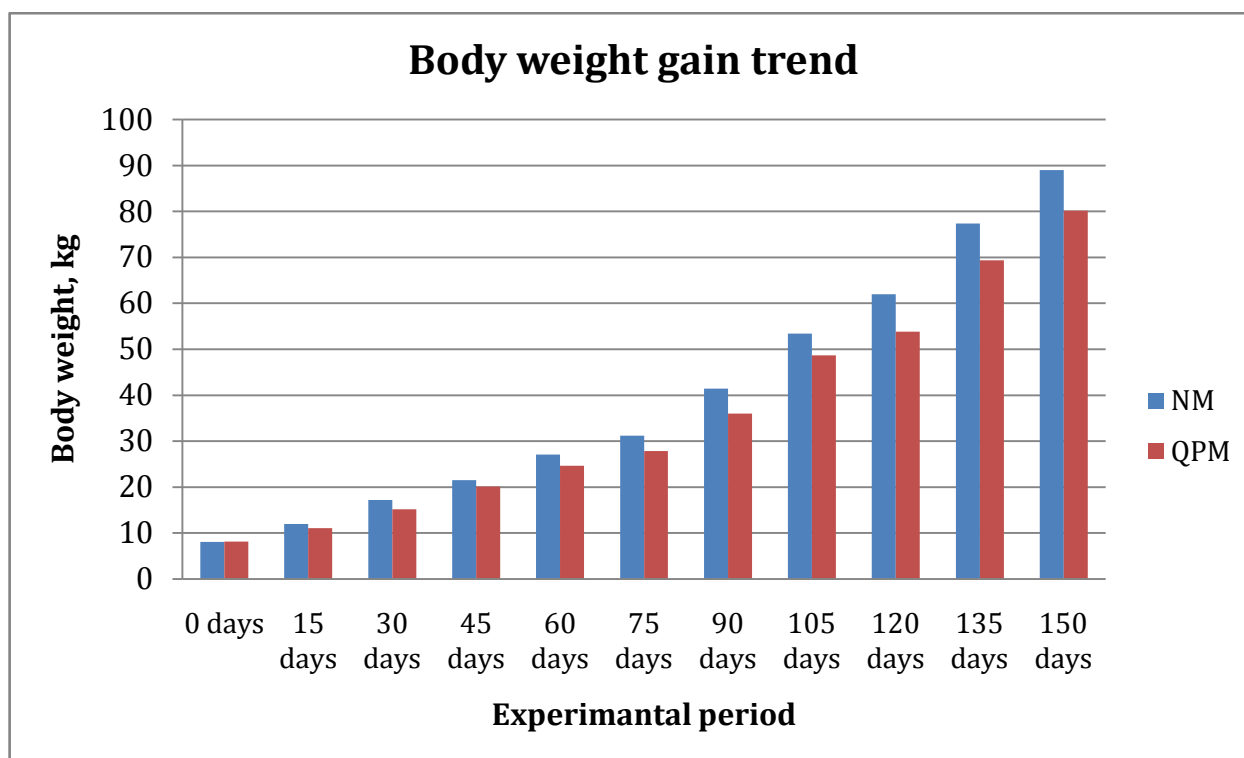


Figure 2 : Body weight gain of piglets fed with QPM and normal maize

IV. DISCUSSION

This study was carried out with objective to compare the growth performance of crossbred piglets fed with normal maize and QPM incorporated concentrate mixture. Results of growth trial suggested that there was no significant ($P>0.05$) effect of QPM over normal maize on growth performance of piglets. It might be due to crossing of QPM with local varieties, subsequently it reduced the lysine and tryptophan content of QPM as mentioned in literatures, however, Cromwell *et.al.* (1967), Sihombing *et.al.* (1969), Marroquin *et.al.* (1973), Maner (1975), Asche *et.al.* (1985), Sullivan *et.al.* (1989) and Gao (2002) reported that QPM significantly ($P<0.05$) improved average daily gain and feed conversion ratio (FCR) in all phase (starter, grower and finisher) of piglet fattening.

Anon (2012), reported that mean body weight of Giriraja chicken was higher in normal maize fed group (18.64 ± 1.01 kg) than that of QPM fed group (17.21 ± 1.28 kg), however, it was not significant between diet groups.

V. CONCLUSION

This experiment revealed that quality protein maize varieties that are available in Nepal are to be crossed with local varieties due to which content of essential amino acids such as lysine and tryptophan is reduced than as mentioned in literatures. Therefore, QPM could not exhibit better performance over normal maize on growth performance of growing piglets.

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Growth Comparison of Female Goats Fed with Treated Soybean Cake and Urea Incorporated Concentrate Mixture in Fodder based Basal Diet in Western Hills of (Nepal)

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Abstract - The domestic goat (*Capra hircus*) is significant throughout the world today, fulfilling a number of needs of various cultural groups. Feeding value of treated soybean cake and urea to goats is not evaluated so far. Therefore, a study was carried out on growing female Khari and Jamunapari and Barberi crosses at Agriculture Research Station (Goat), Bandipur, Tanahun. Twelve female kids (4 – Khari, 4 – Jamunapari cross and 4- Barberi cross) just after weaning of age five months with average body weight of 10.08 kg were selected for experiment (150 days) and were divided into two groups having six animals (2 animals of each breed) in each group by using Complete Randomized Design (CRD). Two types of concentrate mixture (urea and treated soybean cake incorporated) were formulated with 16% of crude protein content. Dry matter requirement was taken @ 4 kg per 100 kg body weight.

Keywords : goats, bypass protein and urea feeding, Nepal.

GJSFR-D Classification : FOR Code: 830304, 321205



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Abstract - The domestic goat (*Capra hircus*) is significant throughout the world today, fulfilling a number of needs of various cultural groups. Feeding value of treated soybean cake and urea to goats is not evaluated so far. Therefore, a study was carried out on growing female Khari and Jamunapari and Barberi crosses at Agriculture Research Station (Goat), Bandipur, Tanahun. Twelve female kids (4 – Khari, 4 – Jamunapari cross and 4- Barberi cross) just after weaning of age five months with average body weight of 10.08 kg were selected for experiment (150 days) and were divided into two groups having six animals (2 animals of each breed) in each group by using Complete Randomized Design (CRD). Two types of concentrate mixture (urea and treated soybean cake incorporated) were formulated with 16% of crude protein content. Dry matter requirement was taken @ 4 kg per 100 kg body weight. All experimental animals were drenched with Fenbendazole @ 5 mg/kg body weight against internal parasites before assigning in experiment. Concentrate mixture was provided to the experimental animals individually @ 1.5% of body weight in plastic vassal once a day in the morning whereas adlib amount of fodder were provided twice a day in-group (morning and evening). Quantity of concentrate mixture and fodder given daily to the animals was weighed daily and refusal was weighed in next morning. Experimental animal had free access to drinking. Total feed intake by the goats was recorded daily for all experimental periods. The body weight gain of individual animals was measured fortnightly in the morning before feeding. Experiment revealed that average daily intake of concentrate mixture was higher (236.1g) in treated soybean cake incorporated concentrate mixture fed group (T1) than urea incorporated group (215.2 g) (T2) whereas fodder intake was higher in T2 (5.62 kg) than T1 (4.53 kg). Feed intake was no significant between groups and fodder intake differed significantly ($P < 0.001$) between groups. Feed conversion ratio per kg body weight gain was observed higher for Treatment 2 (69.42:1) in comparison with T1 (49.34:1). Total body weight gain was recorded higher for T2 (9.07 kg) with average daily gain 51.33 g than Those of T1 (8.1 kg) with average daily gain 46 g. In case of breed,

higher average daily gain was recorded for Khari, Barberi cross and Jamunapari cross (55; 45 and 35 g, respectively) in T1 whereas it was almost similar in T2, although, there was no significant effect of breed between groups.

Keywords : goats, bypass protein and urea feeding, Nepal.

I. INTRODUCTION

The domestic goat (*Capra hircus*) is significant throughout the world today, fulfilling a number of needs of various cultural groups. The most important uses of goats comprise the use of their meat, fibre, hide and manure. Important characteristics of goats are their hardiness and adaptability, as they are able to survive under the extreme conditions. Goats are found all over the world, no matter whether the terrain is flat or mountainous and no matter whether the climate is hot, cold, wet or dry. Goats, thought to be one of the earliest domesticated ruminants in the race of human civilization have a multidimensional, economic, and socio-cultural significance for the Nepalese farmers. Goat is recognized as *poor man's cow* and comprises major small ruminants in most of marginal farmers' in the country and also major source of cash income for most poor peoples in Nepal. Most of the farmers of western hills are rearing Khari goats, crossbred of Khari x Jamunapari and Khari and Barberi (Neopane and Pokharel, 2008). Goat Population of Nepal is estimated to be 9.19 million. Out of 9.19 million, goat population of western hills is 1.13 million which accounts 12.32% of total goat population that producing 5284 Mt meat per annum (10% of total goat meat production) (MoAC, 2012).

Soybean cake is the most extensively used as a protein source for all classes of animals. It has become the standard to which all other protein sources are compared, and its quality, acceptance, and reputation are widely known. The soybean meal contains from 44 to 50% crude protein and from 2500 to 2800 kcal of metabolizable energy per kilogram. Heat treatment increases the amount of soy protein escaping microbial degradation in the rumen. Heat treatment first reduces the solubility of protein and then, if prolonged or

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excessive, reduces the availability of its amino acids to the animal (Smith, 1998). Furthermore, soybean protein is rich in lysine, methionine, valine, and isoleucine. The protein content of soybean tend to be 75 to 80% degraded in the rumen (Broderick *et al.*, 1988; Promkot and Wanapat, 2003), which restricts its inclusion in diets for high-yielding ruminants.

Protein supplementation costs can be reduced if a portion of the protein comes from non-protein nitrogen (NPN) sources such as urea. Rumen microbial growth is dependent on the availability of nitrogen in the form of peptides, amino acids and NH_3 . Fibrolytic bacteria use ammonia as a chief nitrogen source to meet the nitrogen demands of rumen microbes (Russell *et al.*, 1992). Urea is a non-protein nitrogen source, 100% soluble, degradable and therefore very rapidly provides ammonia for microbial protein production. Urea is a cheaper non-protein source of nitrogen commonly used for ruminants feeding due to convenience and availability. Urea has a protein equivalent of 287% protein equivalents on a dry matter basis (NRC, 1989). The microorganisms in the rumen to produce microbial protein use it. It should not make up more than one percent of the complete ration or three percent of a concentrate feed (Solaiman, 2004). Growth comparison of goats fed with urea / treated soybean cake is not evaluated so far in Nepal. Hence, a study

was carried out to compare the growth performance of growing female goats fed with heat-treated soybean meal and urea mixed concentrate mixture at Agriculture Research Station (Goat), Bandipur, Tanahun.

II. METHODOLOGY

a) Experimental Animals

This experiment was carried out on twelve growing female goats (50% Jamunapari - 4, 50% Barberi -4) and female Khari goats (4) at Agriculture Research Station (Goat), Bandipur, Tanahun from 5 May 2012 to 11 September 2012 (069/1/23 to 069/5/26). Female goats of average five months old with average body weight of 10.08 kg were divided into two groups having six animals in each group by using Complete Randomized Design (CRD). They were drenched with Fenbendazole @ 5 mg/kg body weight against internal parasites before assigning in experiment.

b) Concentrate Mixture Composition

Feed ingredients such as maize, soybean cake, rice bran, minerals and salt were procured in Khowpa Feed Industry, Bhaktapur and urea from agro vet. Two types of concentrate mixture were composed for experimental animals having 16% crude protein level that are given in Table 1.

Table 1 : Composition of Concentrate mixture

S/n	Ingredients	T1		T2	
		Part	Crude Protein, %	Part	Crude Protein, %
1	Maize	50	3.95	75	5.92
2	Soybean cake	28	10.7	0	0
3	Urea	0	0	3	8.6
4	Rice bran	20	1.78	20	1.78
5	Mineral mixture	1	0	1	0
6	Salt	1	0	1	0
Total		100	16.43	100	16.3

c) Heat Treatment of Soybean Cake

The drying of forage is known to increase the protection of the proteins. Thorough heating of protein supplement causes denaturation of protein; it provides effective protection against microbial fermentation in the rumen. Heat treatment was done by using hot air oven at temperature 125- 150° C for 2-4 hours as suggested by Suresh, *et al* (2009).

d) Experimental Diet of the Animal

The dry matter requirement of goats was calculated based on 4 kg per 100 kg body weight. Following diets were formulated to the experimental animals (Table 2).

Table 2 : Experimental diets of the animals

Treatment	Experimental Diet
1	Forest mixed fodder (adlib) + soybean cake included concentrate mixture @ 1.5% of body weight
2	Forest mixed fodder (adlib) + urea included concentrate mixture @ 1.5% of body weight

e) Feeding Regime

Concentrate mixture was provided to the experimental animals individually in plastic vassal once a day in the morning whereas *adlib* amount of fodder were provided twice a day in group (morning and evening). Quantity of concentrate mixture and fodder given daily to the animals was weighed daily and refusal was weighed in next morning. Experimental animal had free access to drinking.

f) Chemical Analysis

The samples of feed ingredients, prepared concentrate mixture and forest mixed fodder were sent to the Animal Nutrition Division, Khumaltar, Lalitpur for proximate analysis. Representative samples were analyzed for Dry matter (DM), Crude Protein (CP), Crude Fibre (CF), Ether Extract (EE) and Ash contents (TA). The DM was determined by oven drying at 100°C for 24 hrs. Crude protein of the samples was determined using the Kjeldahl method. Ether extract was determined using Soxhlet apparatus. Ash content was determined by ashing at 550°C in a muffle furnace for 16 hrs (AOAC, 1980). Crude fibre of the samples was determined using

the Van Soest method (Goering, H.K. and Van Soest, 1970).

g) Measurement Recording

The trial period consisted 150 days after an adaptation period of 7 days. Total feed intake by the goats was recorded daily for all experimental period. The body weight gain of individual animals was measured fortnightly in the morning before feeding.

h) Data Analysis

Data of feed intake and body weight gain were analyzed by "t" test for every measurement using computer statistical package Minitab 2003, versions 13.20.

III. RESULTS AND DISCUSSION

a) Chemical Composition of feedstuffs

The result of chemical analysis is given in Table 3 and crude protein content of prepared concentrate mixture was verified in laboratory that is given in Table 4.

Table 3 : Chemical composition of different feed ingredients (% DM basis)

Ingredient	DM	OM	TA	CP	CF	EE
Maize	87.69	97.97	2.03	8.92	2.34	4.48
Rice bran	87.85	89.5	10.5	11.52	4.83	5.1
Soybean cake	86.87	92.63	7.37	44.29	9.38	0.7
Mixed forest fodder	36.17	81.72	18.28	5.81	20.24	NA

The calculated value of crude protein was verified with laboratory analysis, which is presented in Table 4.

Table 4 : Chemical composition of prepared concentrate mixture (% DM basis)

Particular	DM	OM	TA	CP
Soybean cake included concentrate mixture	88	91.2	8.8	16.6
Urea included concentrate mixture	89	89.7	10.3	16.8

DM- dry matter, OM- organic matter, TA- total ash, CP- crude protein, CF- crude fibre.

b) Feed Intake

Average daily intake of concentrate mixture and fodder by goats during experimental periods is given in Table 5. Higher intake of concentrate feed was recorded for T1 (236.1g) than that of T2 (215.2 g) per day which was no significant between groups whereas fodder intake was significantly higher ($P < 0.001$) in T2 (5.62 kg)

than that of T1 (4.53 kg) which resulted higher dry matter intake for T2 (236.05 kg) followed by T1 (195.9 kg). In addition, feed conversion ratio per kg body weight gain was observed higher for T2 (69.42:1) in comparison with T1 (49.34:1). Furthermore, there was no significant effect of breed in concentrate and fodder intake, however, intake of concentrate and fodder was higher in Khari goat than crossbred.

Table 5 : Feed intake of experimental animals/day/animal

Feedstuffs	Mean $\pm$ SE	
	T1	T2
Feed intake, g	236.1 $\pm$ 46	215.2 $\pm$ 37.9
Fodder intake, kg	4.53 $\pm$ 0.01	5.62 $\pm$ 0.02
Total dry matter intake (DMI), kg	195.9	236.05
Feed conversion ratio (FCR)	49.34 : 1 kg	69.42 : 1 kg

c) Growth Performance

Growth is a complex; highly integrated process involving numerous interactions among nutrients, environment, genotype, and many different hormones and receptors of these hormones in various tissues (Spencer, 1985). The growth performance of experimental goats is given in Table 6 and Figure 1. Initial body weight of T1 was 10.92 kg and for T2 were 9.25 kg that reached 19.02 and 18.32 kg during 150 days of experiment for T1 and T2, respectively. Both initial and final body weight was not significant between groups. Total body weight gain was recorded higher for T2 (9.07 kg) with average daily gain 51.33 g than those of T1 (8.1 kg) with average daily gain 46 g. In case of breed, higher average daily gain was recorded for Khari, Barberi cross and Jamunapari cross (55; 45 and 35 g,

respectively) in T1 whereas it was almost similar in T2, although, there was no significant effect of breed between groups.

Table 6 : Growth performance of goats

Parameter	Mean $\pm$ SE	
	T1	T2
Initial Body weight, kg	10.92 $\pm$ 0.89	9.25 $\pm$ 1.8
Initial metabolic weight, Kg	6.0	5.3
Final Body weight, Kg	19.02 $\pm$ 1.5	18.32 $\pm$ 1.3
Final Metabolic weight, kg	9.10	8.85
Total weight gain, kg	8.1	9.07
Average daily gain, g	46	51.33

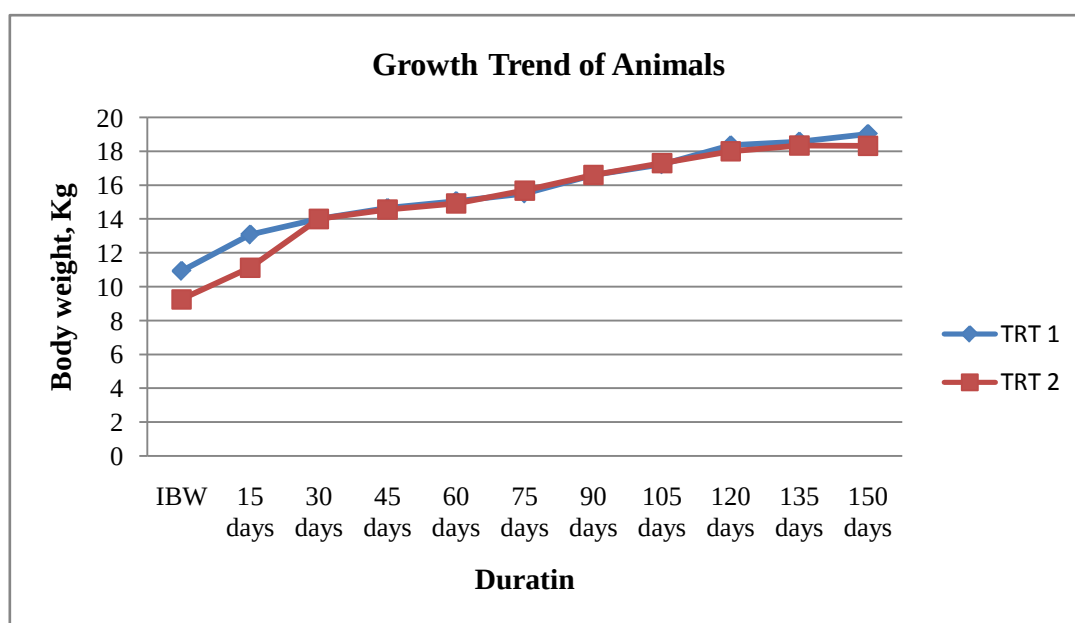


Figure 1 : Body weight gain trend of goats during experiment period

IV. DISCUSSION

This study was initiated with objective to compare the growth performance of female goats of different breeds fed with urea and treated soybean cake incorporated concentrate mixture on fodder based basal diet. Experiment revealed that concentrate feed intake was not significant between diet groups whereas fodder intake was significantly different ($P < 0.001$) between groups which resulted more total dry matter intake of T2 (urea fed group) subsequently higher FCR than treated soybean cake fed group (T1). Initial body weight of T1 was 10.92 kg and it was 9.25 kg for T2 that reached 19.02 and 18.32 kg during 150 days of experiment for T1 and T2, respectively. Both initial and final body weight was not significant between groups. Our experiment proved that 3% inclusion of urea in concentrate mixture is safe and no adverse effect in animal health. Furthermore, incorporation of urea in

concentrate mixture contributes in low cost of compound feed than that with inclusion of soybean cake which cost is higher than urea.

Limea *et al.* (2011) tested the effects of a treated soybean cake incorporated concentrate diet on 32 Creole goats for growth, carcass fat, and fatty acid composition of muscle (supraspinatus), perirenal, and intramuscular adipose tissues. Goats were fed a tropical green forage *Digitaria decumbens* ad libitum with no concentrate (G0) or 1 of 3 levels of concentrate: 140, 240 and 340 g/day, respectively. Goats were slaughtered according to the standard procedure at the commercial body weight (22 to 24 kg). Goats fed the concentrate diets had greater average daily gain ($P < 0.001$), cold carcass weights ($P < 0.001$), perirenal ($P < 0.01$) and intramuscular ($P < 0.01$) adipose tissues weights. Feeding increased concentrate did not increase the content of any cholesterol-increasing saturated fatty acid in meat.

Sahlu *et al.* (2012) conducted an experiment on growing female angora goats with four treatment groups. Experimental animals were fed with low protein high degradability, 12% CP with conventional, solvent-extracted soybean meal; Low protein low degradability, 12% CP with expelled, heat-treated soybean meal; high protein high degradability, 19% CP with conventional, solvent-extracted soybean meal; and high protein low degradability, 19% CP with expelled, heat-treated soybean meal. They reported that average initial body weight of the goats was 22.1 kg and the final body weight was 26.2 kg with no differences ($P>0.05$) in body weight gain between treatments. Mean DMI increased significantly ($P<0.01$) as dietary CP level increased but was not affected significantly ($P<0.05$) by heat treatment of the dietary protein. Their observations were in agreement with those of Roffler *et al.* (1978), Barney *et al.* (1981), Huber and Kung (1981), and Blauwiekel and Kincaid (1986). Others have reported a decrease in DMI when dietary CP was increased (Foldager and Huber, 1979; Edwards *et al.*, 1980; Grieve *et al.*, 1980). A recent study indicated that DMI increased linearly in young growing goats as dietary CP level increased (Lu and Potchoiba, 1990).

Onwuka *et al.* (1989) recommended urea could be incorporated in concentrate mixture of goats at levels between 1 - 5% which defines a save utilization level, however, some other studies recommended higher levels (up to 10%). Chanjula *et al.* (2007) conducted an experiment on growing goats to assess effect of levels of urea and cassava chip (CC) on feed intake, rumen ecology, blood metabolites and microbial populations. Four, Thai native X anglo nubian crossbred growing male goats with average body weight (19 kg) were randomly assigned according to a 4x4 Latin square design. The experimental were provided one of four diets: T1 - urea at 0% (CC=30%), T2 - urea at 1% (CC=40%), T3 - urea at 2% (CC = 50%) and T4 - urea at 3% (CC=60%), of DM basis, respectively. Elephant grass (*Pennisetum purpureum*) was offered on an ad-lib basis. The results revealed that total DM intake and Body weight change were similar among treatments ($P>0.05$). Likewise, rumen pH, BUN, blood glucose, PCV and microbial populations were similar among treatments ($P>0.05$), while NH_3 -N increased as the urea level increased and were found highest ($P<0.05$) in T4 at 12.8 mg/dL. Based on this experiment, it can be concluded that a higher level of urea (3%) could be used with a high level of CC in concentrate and it was good approach in exploiting the use of local feed resources for goat production.

Sopheha *et al.* (2010) evaluated the effect of nitrate-nitrogen diet on the growth performance and rumen gases change in goats fed high in rumen undegradable protein. Twelve young goats were randomly allocated into four treatments with three replications. Urea were subsequently dropped and

replaced by nitrate without changing exogenous nitrogen content to have four levels of nitrate (0, 2, 4 and 6%) based on dry matter intake. There was a very good improvement in feed intake as percentage of body weight ($P<0.000$) when nitrate levels increased. Growth performance was insignificant different ($P>0.05$) with urea as a sole fermentable nitrogen supplement and/ or after being completed replaced by nitrate. However, there was a tendency for goats fed nitrate to have a slightly higher weight gain than urea. The growth curve of all animals is linear when percentage of supplementary nitrate increased respectively although there were some inconsistency in animal performance within early stage of adaptation of 21 days. Rumen ammonia content was high with 34 mg/ 100 ml for 2 and 4% of supplementary nitrate and 42.5mg/100 ml for urea level equivalent to 6% nitrate based on dry matter basis. The results indicate that nitrate can be safely used as rumen supplementary nitrogen source as well as urea to improve animal feed intake and animal performance with another tremendous advantage of reduction of rumen methane emission.

Barth *et al.* (1962) reported gains and feed efficiency of lambs fed urea to be 65% of that of lambs fed isolated soy protein. A combination of 30% wood pulp and 6.5% of an alkaline mineral mixture promoted the highest gains of lambs fed the urea purified diet in which 30, 40 and 50% wood pulp and 3.5, 5.0 and 6.5% minerals were compared. McDonald (1966) reported that a purified diet containing 25% cellulose was optimal for urea nitrogen utilization, and that gains and feed efficiency of lambs was 73% as good with urea as with isolated soy protein. Briiggemann (1967) reported that gains of rams fed a urea containing purified diet were 57% as good as that of rams fed a purified diet containing isolated soy protein. Clifford and Tillman (1968) reported growth of sheep fed the urea purified diet to be 70% as good as growth of sheep fed an isolated soy protein purified diet. Bunn *et al.* (1964) reported that gains and feed efficiency were about 50% as good when urea was compared to casein in purified diets for sheep. Goodrich and Tillman (1968) reported that growth of lambs fed urea was about 80% of those fed isolated soy protein in a 60-day purified diet study. The results from these studies indicate that when NPN completely replaces the protein in purified diets, growth rate and feed efficiency are about 65% as good on the NPN diet as on the protein containing diets. Furthermore, there appears to be a trend for a further reduction in animal performance in extended growth trials.

V. CONCLUSION

Our experiment revealed that perhaps amount of bypass protein of soybean cake and production of

microbial protein by rumen microbes is almost same. Therefore, there was not significant differences in body weight gain between diet groups. Incorporation of 3% urea in concentrate mixture of goats is safe and no adverse effect on animal health.

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Detection of Antibodies against *Borrelia Burgdorferi* in Periparturient Cows and Calves during the First Year Old by Indirect Enzyme - Linked Immunosorbent Assays (iELISA)

By Jenevaldo Barbosa Da Silva, Bruna De Azevedo Baêta, Carla Carolina Dias Uzedo Ribeiro, Rafaella Câmara Teixeira & Adivaldo Henrique Da Fonseca

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Abstract - The aim of this study was to understand the dynamics of circulating antibodies against *Borrelia burgdorferi* in cows during the peripartum and in their calves during the first year of life, using an indirect enzyme-linked immunosorbent assay (iELISA). Sera from twenty cows and their calves were tested by an iELISA for detection of homologous antibodies against *B. burgdorferi*. The test showed 93.33% sensitivity and 86.66% specificity. At pre-partum, birth and post-partum, cows showed seropositivities of 90%, 30% and 86%, respectively. However, only 50% of the calves were seropositive after colostrum ingestion. The calves' seropositivity over their first year ranged from 0% in the second and third months to 64% at 12 months. Therefore this region should be considered an enzootic instability area.

Keywords : *spirochaetes, antibodies, bovines, elisa, borrelia.*

GJSFR-D Classification : FOR Code: 030104, 060107



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Abstract - The aim of this study was to understand the dynamics of circulating antibodies against *Borrelia burgdorferi* in cows during the peripartum and in their calves during the first year of life, using an indirect enzyme-linked immunosorbent assay (iELISA). Sera from twenty cows and their calves were tested by an iELISA for detection of homologous antibodies against *B. burgdorferi*. The test showed 93.33% sensitivity and 86.66% specificity. At pre-partum, birth and post-partum, cows showed seropositivities of 90%, 30% and 86%, respectively. However, only 50% of the calves were seropositive after colostrum ingestion. The calves' seropositivity over their first year ranged from 0% in the second and third months to 64% at 12 months. Therefore this region should be considered an enzootic instability area.

Keywords : *spirochaetes*, *antibodies*, *bovines*, *elisa*, *borrelia*.

I. INTRODUCTION

Lyme borreliosis is an infectious disease caused by spirochaetes of the *Borrelia burgdorferi* sensu lato complex, which comprises at least 18 species worldwide (Margos et al. 2010). The spirochaetes can infect humans and animals (Fingerle et al. 2008), and lyme borreliosis is considered the most prevalent tick-borne disease in Europe and the United States of America (USA). In these countries, the infection is usually detected by identification of antibodies against specific antigens of *Borrelia* sp. in body fluids. However, in Latin America there are still no standardized techniques due to the difficulty of producing antigens of good quality on a large scale.

For the detection of antibodies against *Borrelia* sp. in immunoassays, such as enzyme-linked immunosorbent assay (ELISA) and enzyme-linked fluorescent assay (ELFA), antigens have been purified from long-term *in vitro* cultures. Establishing *in vitro* cultures from local strains to use as antigen sources is

hampered primarily by the need for complex and costly culture media, as well as variation in growth rates and gene expression between strains (Yang et al., 2001).

In North America and Europe, most ruminants positive for Lyme disease are asymptomatic. Indirect enzyme-linked immunosorbent assays (iELISA) and Western blotting techniques are most suitable for serological diagnosis in these animals, but should be interpreted in conjunction with epidemiological data (Fonseca et al., 1996; Ishikawa et al., 1997).

In Brazil, seroepidemiological studies on domestic animals have previously detected antibodies against *B. burgdorferi* in dogs (Alves et al., 2004), horses (Gallo et al., 2009), cattle (Guedes Júnior et al., 2008) and buffaloes (Corrêa et al., 2012). Following on from this, the aim of this study was to use iELISA to determine the dynamics of circulating antibodies against *B. burgdorferi* in periparturient cows, and in their calves during their first year of life.

II. MATERIAL AND METHODS

A longitudinal study was conducted between 2009 and 2011 in the dairy cow sector at the Seropédica Experimental Station, which belongs to the Agricultural and Livestock Research Company of the State of Rio de Janeiro (Empresa de Pesquisa Agropecuária do Estado do Rio de Janeiro; Pesagro-Rio). Monthly sera samples were taken from 20 cows during their last two months of pregnancy, month of birth and first two months of lactation. Their offspring were sampled monthly from birth through the first year of life.

The pasture system consisted of rotation in fields of *Brachiaria decumbens* and *Panicum maximum*, with stocking density of three animals per hectare. During the study ticks were observed on animals and pastures. The animals were dewormed (levamisole phosphate, 1ml/50kg, BLLVER) every three months and treated against ticks (Fluazuron, 1ml/10kg, Ouro Fino) monthly.

Blood serum samples were tested by iELISA using the technique described by Machado et al. (1997) for *Babesia bovis*, adapted to *B. burgdorferi*. The protein

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concentration of antigen, from *B. burgdorferi* sensu stricto G 39/40 of North American origin, was adjusted to 5 µg/mL. The plates (Costar 3590, Corning Co.) were sealed and incubated overnight at 4 ° C. The test samples were diluted 1:400 in PBS-Tween with 5% rabbit serum, and 100µl were added to ELISA plate. After an incubation at 37°C in humid chamber for 90 minutes, 100 µl of the alkaline phosphatase anti-bovine IgG (Sigma Chemical Co.) at 1:30000 according to manufacturer's recommendations were added to each well. The plates were incubated in the same conditions

before. The substrate p-nitrophenyl phosphate (PNPP, Sigma Chemical Co.) was added at 5mg per plate and the plates were incubated at room temperature. After 50 min, the absorbance was read at 405 nm in a micro-ELISA reader (Labsystems iEMS Reader MF).

The immunological response of each serum was estimated at each dilution by determining the positive serum ratio (S/P), calculated from positive and negative reference sera (Machado et al. 1997) using the following equation:

$$S/P = \frac{(\text{mean sample absorbance}) - (\text{mean absorbance of negative reference serum})}{(\text{mean absorbance of positive serum reference}) - (\text{mean absorbance of negative reference serum})}$$

Optical density values were grouped into ELISA levels (EL), which ranged from 0 (lowest level) to 9 (highest level). The maximum amplitude from the lowest level was determined by the mean absorbance values of the negative group plus two standard deviations, as established by Machado et al. (1997). The subsequent levels were determined by increments of 35%. Cutoff was calculated according to Frey et al. (1998), with 12 negative sera for each plate.

The chi-square test or Fisher's exact test was used to determine significant differences in the percentages of samples testing. P values <0.05 were considered statistically significant. Analysis was performed by the statistical software R Foundation for Statistical Computing, version 2.12.2 (2011).

III. RESULTS

The serological results for the presence of homologous antibodies against *B. burgdorferi* in periparturient cows and their calves during the first year of life are shown in Table 1 and Figure 1.

Three weeks before birth, 90% of cows were seropositive, a week before the birth this dropped to 30%. The same cows two months after birth showed 86% seropositivity for *B. burgdorferi*. Despite the high percentage of seropositive cows and a significant migration of antibodies to colostrum, only 50% of the calves were observed to be seropositive after ingestion of colostrum. In addition, there was a significant variation in the prevalence of homologous antibodies against *B. burgdorferi* in calves during the first year of life.

All the calves were seronegative for *B. burgdorferi* during their second and third months. Subsequently, between the fourth and tenth months, the percentage of seropositive animals ranged from 20% (4/20) to 40% (8/20). In the 11th and 12th months, the calves showed a significant increase in the prevalence of antibodies to *B. burgdorferi*, reaching a maximum of 64% seropositivity in 11th month (Figures 2 and 3).

Only four calves were consistently seropositive from the first infection (four months old) until the twelfth month, while five animals were seronegative throughout the study. After the loss of maternal antibodies, 20% of the calves became positive for the first time at four months, 5% at five months, 10% at six months, 10% at nine months, 20 % at eleven months and 10% at twelve months.

IV. DISCUSSION

The use of enzyme linked immunosorbent assays with recombinant antigens produced from cell culture systems has improved sensitivity and specificity for the detection of antibodies against *B. burgdorferi* in humans, canines, and horses (Schulte-Spechtel et al. 2003). For studies in cattle, *B. burgdorferi* antigens produced from cell cultures are used in ELFA and iELISA (Wells et al. 1993).

The occurrence of probable Lyme disease in Brazil, known there as Baggio-Yoshinari (Mantovani et al., 2007), and the close phylogenetic association found in affected cattle from Brazil from PCR for *B. burgdorferi* using *flgE* primer by Mantovani et al. (2012), suggested the possibility of serological cross-reactivity between spirochetes of the genus *Borrelia* (Rogers et al., 1999), justifying the seroepidemiological study in cattle. The rate of seropositive cattle indicates the presence of some agent of tick-borne spirochetosis in the herd assessed, as previously observed by Guedes Júnior et al. (2008), who found 54.9% seropositivity to *B. burgdorferi* in dairy cows in the state of Pará, Brazil.

The age of the animal demonstrated a positive relationship with seropositivity, in which cows had higher percentage of seropositivity than calves. Stefancikova et al. (2002) found a similar higher seroprevalence in older cows. Lyme borreliosis has often been found in first-birth heifers, presenting as a problem affecting particular herds (Parker; White, 1992).

The fall in antibody titers in cows during the pre-partum demonstrated efficiency in passive transport of

antibodies against *B. burgdorferi* via colostrum. However, the small number of seropositive calves after colostrum ingestion shows failure in some stage of lactation (Sasaki et al., 1976).

The increase in the percentage of seropositive calves during the first year of life demonstrates the existence of some environmental transmission, since most of the agents of the complex *Borrelia burgdorferi* sensu lato are transmitted by ticks of the family Ixodidae (Bennett, 1995; Barbour et al., 1996).

V. CONCLUSIONS

Although an organism of the genus *Borrelia* has not been isolated from cattle in Brazil, the high seroprevalence observed in this study is a strong indication that this pathogen exists. Molecular studies should be undertaken in order to confirm the agent in these animals.

The decrease in antibody titers in cows during the pre-partum demonstrated efficiency in passive transport of antibodies against *B. burgdorferi* via colostrum. Furthermore, the increase in the percentage of seropositive animals during the first year of life, suggests the existence of some environment transmission, however, studies of possible vectors, such as *Rhipicephalus microplus* and wild hosts, are necessary.

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Legends for Illustrations and table

Table 1 : Values of positive serum ratio for ELISA levels 0-9, during the periparturient cows and their calves in the first year of life

EL	S/P	Calves		Cows		
		<6 months	>6 months	Pre-partum	Birth	Post-partum
0	0 – 0.173	15.0%	0.0%	0.0%	20.0%	0.0%
1	0.174 – 0.235	22.0 %	5.0%	8.0%	30.0%	15.0%
2	0.236 – 0.318	21.0%	12.0%	5.0%	20.0%	10.0%
3	0.319 – 0.430	18.0%	30.0%	20.6%	20.0%	15.0%
4	0.431 – 0.582	17.0%	30.0%	40.0%	10.0%	20.0%
5	0.583 – 0.787	7.0%	14.0%	10.0%	5.0%	15.0%
6	0.788 – 1.0.63	0.0%	4.0%	2.0%	0.0%	10.0%
7	1.064 – 1.436	0.0%	3.0%	10.0%	0.0%	10.0%
8	1.437 – 1.940	0.0%	2.0%	5.0%	0.0%	5.0%
9	> 1.941	0.0%	0.0%	0.0%	0.0%	0.0%

EL – ELISA levels; S/P - positive serum ratio

Figure 1 : Absorbance values of sera from cows naturally infected with *Borrelia burgdorferi* during the peripartum

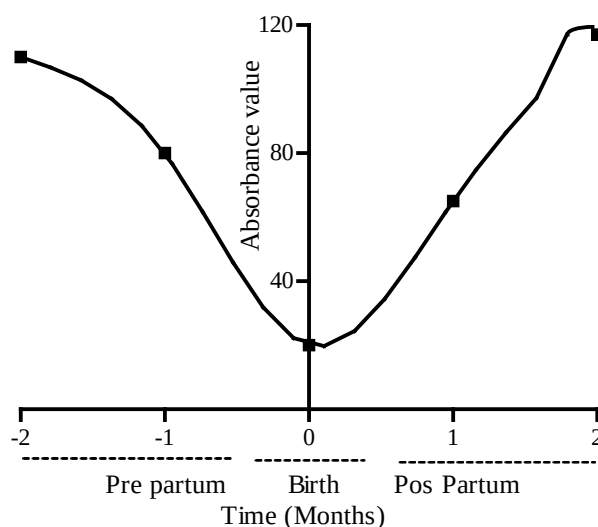


Figure 2 : Absorbance values of sera from calves naturally infected with *Borrelia burgdorferi* during the first year of life

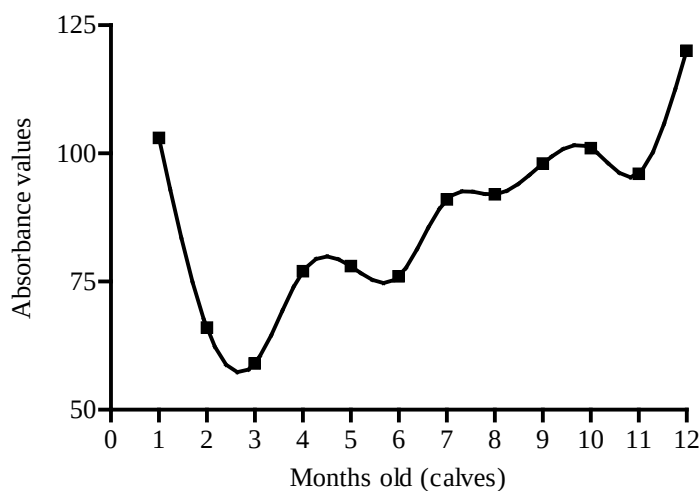
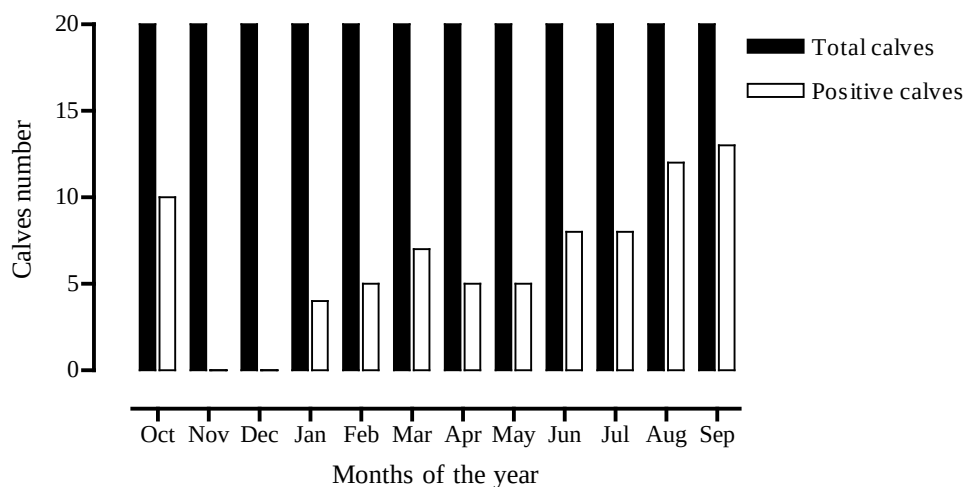


Figure 3 : Calves number naturally infected with *Borrelia burgdorferi* during the first year of life



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Influence of Herbicides and Agriculture Density on Weeds Associated with Crop Soybean (Glycine Max L)

By A.A.A. Hassan

Botany Department National Research Center, Cairo Egypt

Abstract - Two filed experiments were conducted at the Agricultural Experimental Farm during two seasons, to study some weed control treatments and plant density (distance between plants) on weeds competition in soybean fields. Each experiment included 16 treatments which were the combination of 8 weed control treatments (6 herbicides beside hoeing and un weeded treatment) and two distances between plants namely, 5 and 10 cm (70000 & 140000 plants/fed.). The obtained results showed that the favorite weed control treatments were hoeing (twice) followed by trifluralin and diphenamid in 1st and 2nd season, hoeing (twice) treatment gave the highest decrease in total fresh weight of weeds, followed by pendimethalin, dinitramine and linuron. The total fresh weight of weeds was significantly decreased at 5cm distance between plants as compared with those at 10cm distance. The effect of the interaction between weed control treatments and distance between plants caused a significant effect on fresh weight of weeds. The effect of hoeing (twice) on fresh weight of weeds at narrow plant distance was greater than that at 10 cm distance.

Keywords : herbicides, agriculture density, weed, soybean.

GJSFR-D Classification : FOR Code: 070199, 820405



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Keywords : herbicides, agriculture density, weed, soybean.

I. INTRODUCTION

The presence of weeds in soybean fields reduces crop yield from 40 to 50 percent depending on the intensity of weed in visitation Idapuganti et al. (2005) observed *Echinochloa colona*, *Cyperus rotandus*, *Trianthema portulacastrum*, *Digera arvensis*, *Commelina benghalensis*, *Digitaria sanguinalis*, *Phyllanthus niruri* and *Dactyloctenium aegyptium* in soybean crop. Guliqbal et al. (2005) reported *Cyperus rotandus*, *Dactyloctenium aegyptium*, *Eragrostis piolsa* and *Commelina benghalensis* in soybean field. Kushwah and Vyas (2006) found *Caesulia axillaris*, *Echinochloa colona*, *Cyperus iria*, *Cyperus rotandus*, *Commelina benghalensis*, *Digitaria sanguinalis* and *Acalypha indica* in soybean crop. Malik et al. (2006) identified *Celosia argentea*, *Digera arvensis*, *Echinochloa colona*, *Dactyloctenium aegyptium*, *Cyperus rotandus* and *Trianthema portulacastrum* in soybean field. Bhan et al.,

(1972). Dowler and parker (1975) mentioned that cultivation plus hand hoeing gave the best weed control.

Many investigators found that prometryne Singh et al., (1973) and Doersch,"(1980). Linuron Sanchez, (1974); Baronova et al. (1975) and Abdel Raouf and Fayed, (1978), hoeing treatment Fayed et al., (1983). Trifluralin and metribuzin at 1.0 + 0.5 kg/ha Cruz et al., (1980), stomp Moursi et al., (1980), linuron-butralin mixture Salim, (1982) and prometryne, prometryne + amex, prometryne + ronstar and hoeing treatments Moshtohory (1982) gave a favourite effect on weeds.

Chauhan et al. (2002) revealed that the application of alachlor at 1.5 kg and, pendimethalin 1.5 kg /ha as pre-emergence and two hand weeding at 20 and 35 DAS in soybean crop drastically reduced weed density, weed biomass and increased the yield of crop. Rohitshav et al. (2003) reported that pre-emergence application of pendimethalin 1.5 kg /ha produced soybean grain yields similar to weed free treatment. Rajput and Kushwah (2004) observed that pre-emergence application of pendimethalin at 1.0 kg/ha followed by one hand weeding at 30 days after sowing was the most profitable for controlling the weeds in soybean

Pandya *et al.* (2004) found that two hand weedings and clomazone with hand weeding produced higher grain yield. Crop geometrics failed to record significant influence on grain yield.

Rajput and Kushwah (2004) observed that two hand weeding alone 20 and 30 DAS after sowing gave highest weed control efficiency 85.6% with seed yield 1860 kg/ha.

Not only herbicides but also the plant density are among the factors that have an important role in keeping soybean fields free of weeds. Gurnah (1978) showed a very high plant population gave better weed control than lower populations. The present investigation was carried out to influence of herbicides and agriculture density on weeds associated with crop soybean (*Glycine max* L)

II. MATERIAL AND METHODS

Two filed experiments were conducted at the agricultural experimental farm during two seasons,. the soil of the experiments was clay loam with medium fertility, containing 1.89% organic matter and pH7.8.

A Factorial experiment in randomized complete block design with four replicates was used. The plot size was 20 m² (4 m x 5 m) with 5 rows (5 m in length and 70 cm apart); Each experiment included 16 treatments which were the combinations between 8 weed control treatments and 2 plant densities.

a) *Weed control treatments were as follow*

1. Dintramine (cobex or USB 3584): N³, N³- Diethyl 2,4 -Dinitro -6- trifluoromethyl-1,3- phenylenediamine (2.5 % E.C) at a rate of 1.0 L/fad.
2. Pendimethalin (stomp, Ac. 92553) N (1-Ethylpropyl)- 2,6 dinitro-3,4-xylidine (33%E.C) at a rate of 2.5 L/fad.
3. Trifluralin (Treflan): Trifluoro 2, 6 – dinitro-N-N dipropyl-p-toluidine (48% E.C) at a rate of 1.0 L/fad.
4. Prometryne (Gesagard 50 % a.i. w.p.) 2 methoxy 4, 6 bis isopropyl amino 2 methyl thio 1,3,5 triazine at a rate of 1.0 Kg/fad.
5. Linuron (Afolon 50% a.i. w.p.) N 1, 3, 4- dichlorophenyl N-methoxy-N-methyl urea at a rate of 1.0 Kg/fad.
6. Diphenamid (Enide 50% W.P.) N-N-dimethyl-2, 2-diphenyl acetamide at a rate of 2.0 Kg/fad.
7. Hand hoeing (Twice) after 15 and 25 days from sowing.
8. Control (un weeded).

b) *Distance between plants were as follows:*

1. 5 cm between plants (140000 plants / fad).
2. 10 cm between plants (70000 plants /fad).

All herbicides were sprayed on soil surface and incorporated immediately into the soil and irrigation was carried out on the same day. The used rates were as product form. Sprayers sack with water volume of 200 liters per faddan was used.

Soybean seeds var. Clark were sown on 24th and 18th of April in the 1st and 2nd seasons, respectively. When the soil moisture was adequate for germination, after thinned in order to give the proper distance between plants and density. Nitrogen fertilizer was applied at 100 kg /fad. in the form of urea (46%N).

Weeds were hand pulled from one line of the middle row of each plot after 30th and 60th days from sowing and calculated to gramme per square meter. Fresh weight of weed species and total weeds were recorded to the nearest gramme.

All data obtained in both seasons were subjected to the proper statistical analysis for both seasons as well as the combined analysis was also carried out according to Snedecor and Cochran (1967). Treatment means were compared using Duncan's multiple range test (Duncan, 1955) at the 5% level of probability.

III. RESULTS AND DISCUSSION

a) *Effect of weed control treatments on weeds*

The major weed species associated with the soybean crop in 1st seasons were mostly broad-leaved weeds and they were as follow, *Portulaca oleraceae* L. (*Purslane*), *Chenopodium murale* L. (Goose foot), *Amaranthus caudatus* L. (Pig weed). In 2nd season, the prevailing weeds were; *Beta vulgaris* L. (leaf beet), *Chenopodium murale* L. (Goose foot), *Medicago hispida* L. and *Echinochloa colonum* (Jungle rice) as the only grass weed. In both seasons *Cyperus* sp. L. (nut sedge) was the only perennial weed appeared in the field plots.

Data recorded in Figures (1-4) showed the effect of weed control treatments on the fresh weight of weeds assessed at 30 and 60 days from sowing.

The available results revealed clearly that the fresh weights of weed species as well as their total fresh weight were significantly affected by weed control treatments. This hold fairly true for the two growing seasons at 30 and 60 days from sowing. The lowest total fresh weight was recorded with the two-hand weeding treatment which was significantly lower than other treatments under investigation. This finding was quite expected since the weed assessment was carried out after 5 days from the second hoeing Figures (1-4).

At 30 days from sowing, all herbicidal treatments reduced to different extents the total fresh weight of weeds, but differences between them were not great enough to reach the significant level. This hold fairly true for 1st and 2nd growing seasons.

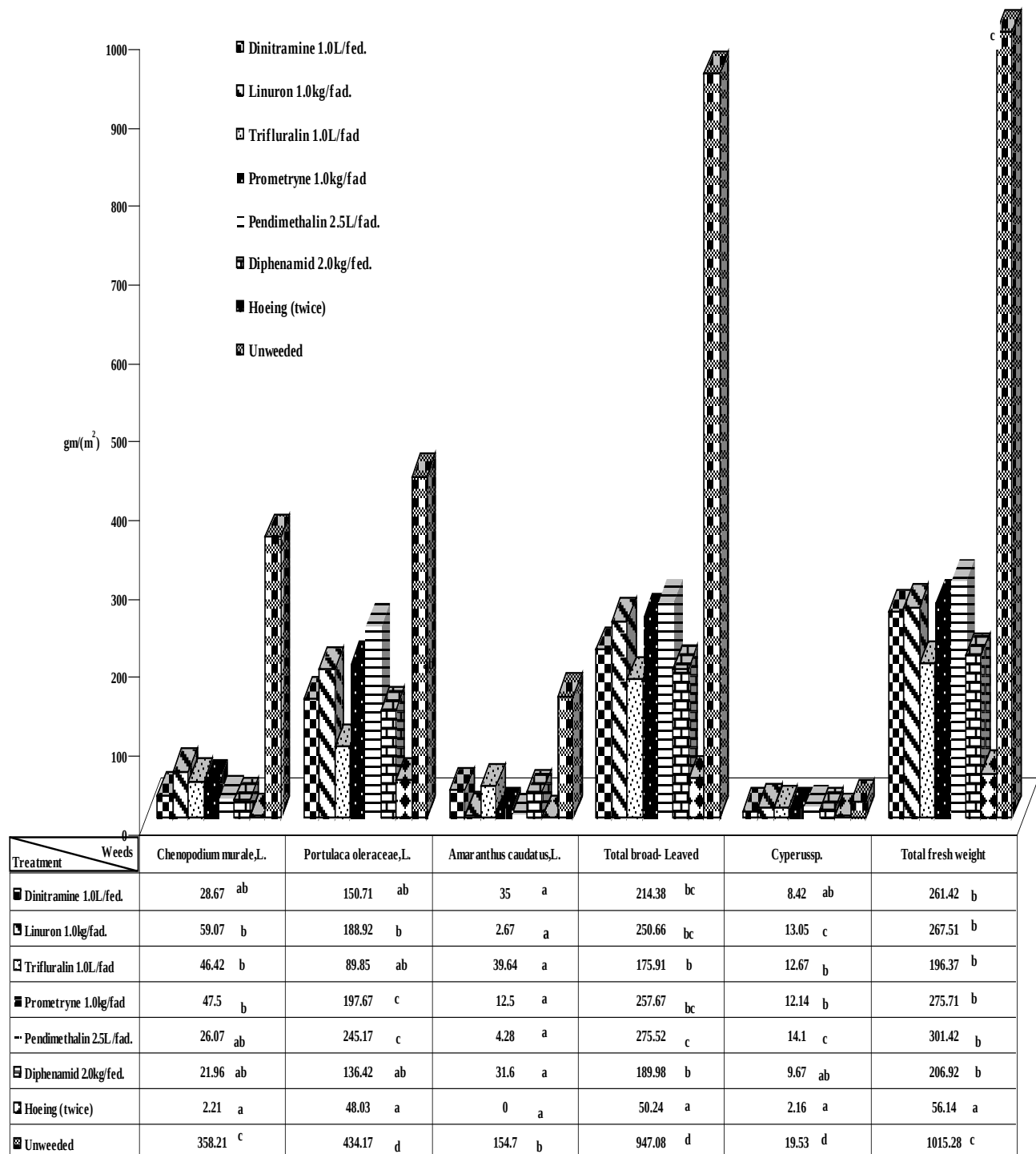


Figure 1 : Effect of weed control treatments on fresh weight of weeds after 30 days from sowing in 1st season (gm/m²)

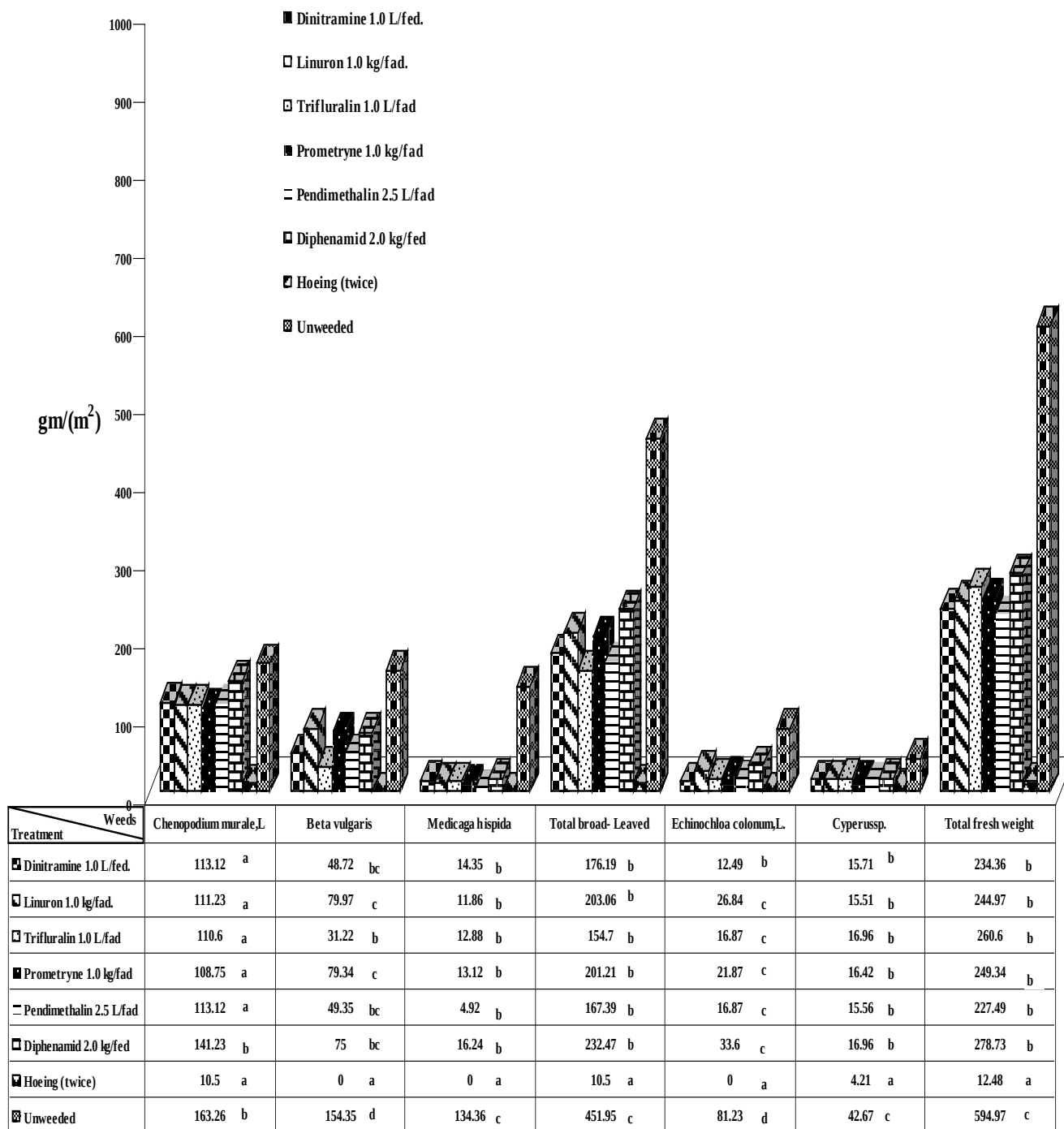


Figure 2 : Effect of weed control treatments on fresh weight of weeds after 30 days from sowing in 2nd season (gm/m²)

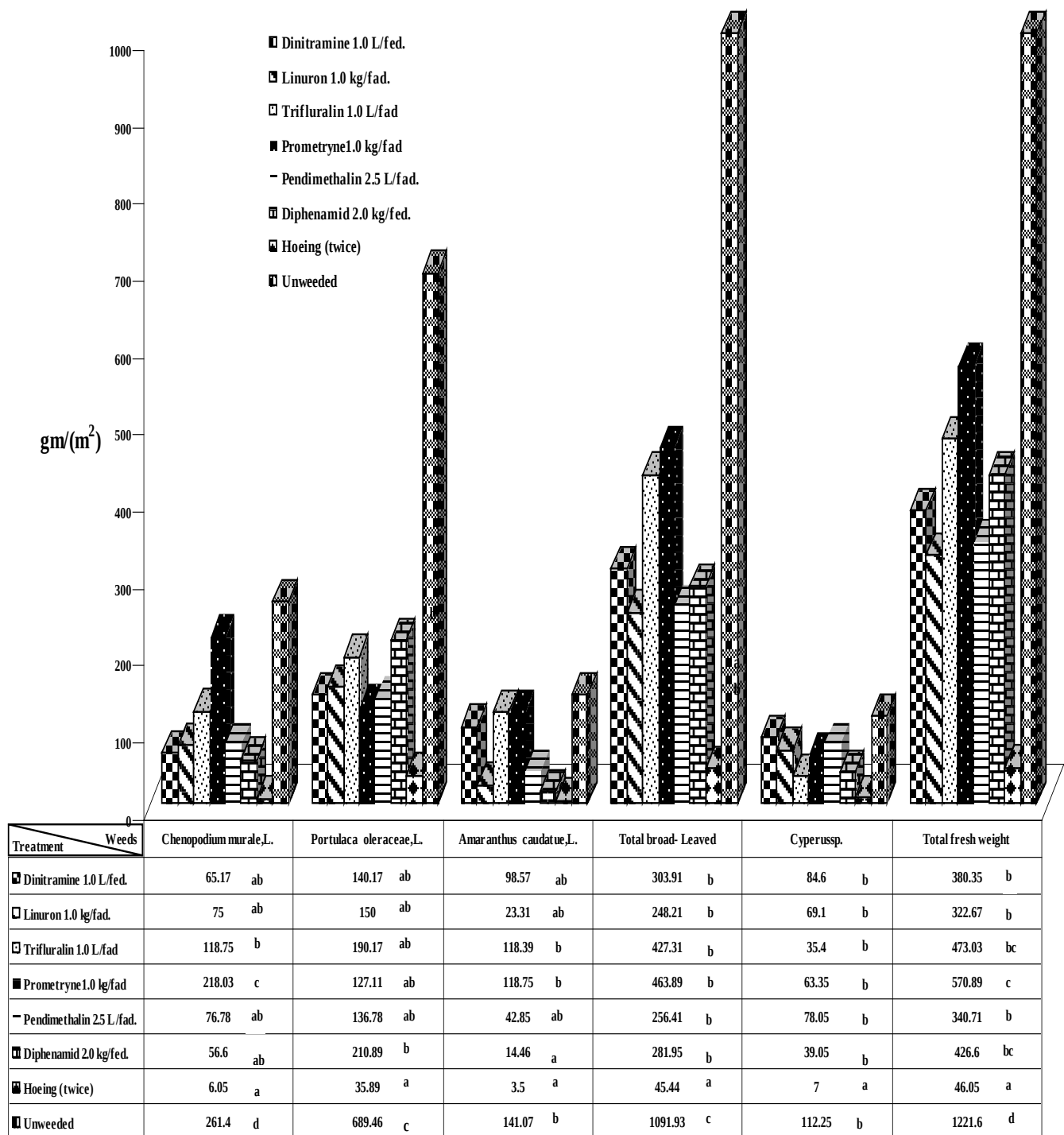


Figure 3 : Effect of weed control treatments on fresh weight of weeds after 60 days from sowing in 1st season (gm/m²)

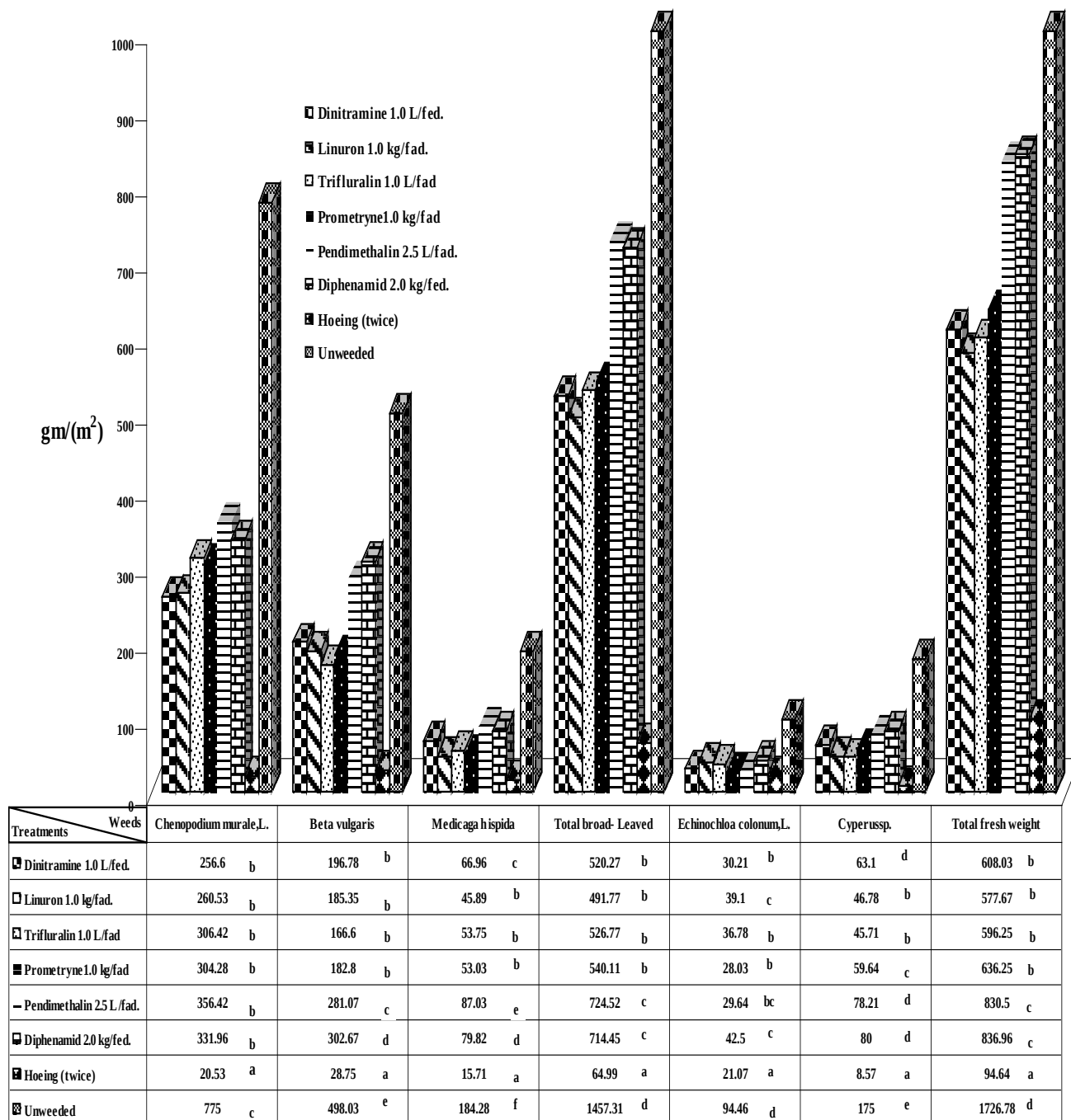


Figure 4 : Effect of weed control treatments on fresh weight of weeds after 60 days from sowing in 2nd season (gm/m²)

These results are in agreement with those early reported by Dowler and Parker (1976), Salim (1982) and Moshtohry (1982).

Rohitshav *et al.* (2003) reported that pre-emergence application of pendimethalin 1.5 kg /ha produced soybean grain yields similar to weed free treatment. Rajput and Kushwah (2004) observed that pre-emergence application of pendimethalin at 1.0 kg/ha followed by one hand weeding at 30 days after sowing was the most profitable for controlling the weeds in soybean.

Concerning the effect of herbicidal treatments on present weed species, results revealed the following:

- a) All herbicidal treatments reduced significantly the fresh weight of all weed species present in 1st and 2nd growing seasons if compared with the un weeded treatment.

These results are in harmony with those obtained by Singh *et al.* (1973) Sanchez (1976) Baronova *et al.* (1975), Cruz *et al.* (1980) and amy *et al.* (2012)

- b) No significant differences among the studied herbicidal treatments were recorded on the following weed species: *Chenopodium murale* L., *Amaranthus caudatus* L., and *Medicago hispida*.

Abdel Raouf and Fayed (1978) stated that linuron at 1.5 kg/fad. gave the best control of broad-leaved weeds in soybeans, while Moshtohry (1982) reported that the depression in dry weight of soybean weeds amounted 43.01, 47.39, 47.78 and 84.53 % over the control for prometryne, prometryne + amex, prometryne + ronstar and hoeing treatments, respectively. Amex treatment had the lowest controlling effect on broad-leaved weeds.

- c) The effect of herbicidal treatments on the fresh weight of *Beta vulgar* and *Portulaca oleraceae* L. varied greatly. The lowest fresh weight was obtained with trifluralin treatment while the highest was recorded with linuron and pendimethalin treatments, respectively.

Sanchez, *et al* (1976) indicated that linuron application at a rate of 3.5 kg/ha. gave good control of *Portulaca oleracea*, while Doersch (1980) found that trifluralin at 0.75 lb/acre, and pendimethalin at 1.5 lb/acre, all incorporated pre-sowing gave 76% control of annual broad – leaved weeds .

- d) The fresh weight of *Echinochloa colonum* L. was significantly reduced by weed control treatments. The lowest weight was obtained with hoeing followed by that of dinitramine treatment. Differences among the rest of the herbicidal treatments were not great enough to reach the level of significance. Fayed *et al.* (1983) reported that trifluralin and metribuzin at 1.0 + 0.5 kg/ha. gave the best selective control of grasses in soybean. But Doersch, (1980) Concluded that trifluralin at 0.75 lb/acre, and pendimethalin at 1.5 lb/acre, all

incorporated pre-sowing, gave an average of 97% control of annual grasses.

Date presented in Figures (3and 4) showed the effect of weed control treatments on weed species after 60 days from sowing in 1st and 2nd growing seasons, respectively.

The available results indicated that the total fresh weight of weeds was significantly reduced by weed control treatments. The lowest fresh weight of the different weed species under investigation as well as their total fresh weight was recorded with the two-hand weeding treatments. This was true for the 1st and 2nd seasons.

Results also revealed that all herbicidal treatments affected to different extents the total fresh weight of weeds. The lowest fresh weight was recorded with linuron treatments which does not differ significantly from those treatments of dinitramine and trifluralin. The superiority of linuron treatment in 2nd could be attributed to its effective control of weed species. On the contrary, the highest fresh weight of weeds was recorded with prometryne and diphenamid treatments in 1st seasons and with diphenamid and pendimethalin treatments in the 2nd season.

These differences in the activity of herbicidal treatments under investigation from 1st to 2nd season is mainly attributed to the different responses of the different weed species present in the two seasons. Concerning the effect of the studied herbicidal treatments on the major weed species in the field plots could be summarized as follow :-

1. The effect of diphenamid or pendimethalin treatments on fresh weight of *Bate vulgaris*, *Medicago hispida* and *Echinochloa colonum*, L. were much lower than those of other herbicidal treatments. The decreases in fresh weight of *Beta Vulgaris* amounted 39.22 and 43.56% of the un weeded treatments due to diphenamid and pendimethalin treatments, respectively.
2. The lowest fresh weight of *Chenopodium murale* and *Amaranthus caudatus* L. weeds was recorded by diphenamid treatments which does not differ significantly from the hand weeding treatment. The decreases in their fresh weight amounted 78.34 and 89.74 % of the control treatment, respectively. On the contrary, the lowest controlling effect of *Chenopodium murale* and *Amaranthus caudatus* L. weeds was obtained by prometryne followed by that of trifluralin treatment.
3. Concerning the effect of herbicidal treatments on *Portulaca oleraceae*, results revealed no significant differences but diphenamid showed the lowest killing effect followed by tifluralin treatment.

b) Effect of plant distance on weeds

In both seasons, plant distance (density) showed significant effects on weed attributes assessed

after 30 and 60 days from sowing. Results in Table(5) indicated that higher fresh weight of weed species was recorded with the wider distance, between plants (lower plant density).

This hold fairly true for both seasons after 30 and 60 days from sowing for almost all weed species.

The dominant weeds were as follow in descending order; *Portulaca oleraceae*, L., *Chenopodium murale*, L. and *Amaranthus caudatus*, L. in 1st season and were *Chenopodium murale*, L. *Beta vulgaris* and *Medicago hispida* in 2nd season.

The reduction in fresh weight of the a above weed species due to narrow planting after 30 days from sowing amounted 27.09, 50.71 and 58.64% in 1st season and 25.83, 3.8 and 27.93 % in 2nd season.

Nice et al. (2001) found that increasing soybean populations from 245,000 plant/ha to 481,000 and 676,000 plants/ha coupled with reduced row spacing reduced sicklepod (*Senna obtusifolia* L.)

These results are in agreement with those obtained by Mcwhorter and Barrentine (1972), Gurnah (1978), Moshtohry (1982). and Guillermo (2009).

Table 5 : Effect of plant distance treatments on fresh weight of weeds (gm/m²). After 30 and 60 days from sowing

Weeds	After 30days from sowing				After 60days from sowing			
	1 st		2 nd		1 st		2 nd	
	Distance (cm)							
	5*	10**	5*	10**	5*	10**	5*	10**
<i>Chenopodium murale</i> ,L.	48.11 a	97.61 b	92.25 a	124.38 b	94.59 a	123.34 b	268.39 a	357.63 b
<i>Portulaca oleraceae</i> ,L.	160.21 a	219.75 b	–	–	186.33 a	210.08 b	–	–
<i>Beta vulgaris</i>	–	–	63.56 a	66.08 a	–	–	192.40 a	268.12 b
<i>Amaranthus Caudatus</i> ,L.	23.43 a	56.66 b	–	–	68.30 a	93.98 b		
<i>Medicago hispida</i>	–	–	21.70 a	30.11 b	–	–	60.08 a	86.61 b
Total broad-leaved	231.75 a	374.02 b	177.51 a	220.57 b	349.22 a	427.40 b	520.87 a	712.36 b
<i>Grass weed</i> <i>Echinochloa colonum</i>	–	–	19.98 a	32.32 b	–	–	33.34 a	47.10 b
Perennials weed <i>Cyperus sp.</i>	12.85 a	10.08 a	15.38 a	20.63 b	52.41 a	69.80 b	63.20 a	92.94 b
Total fresh weight	287.46 a	367.78 b	243.41 a	321.07 b	422.14 a	522.14 b	611.12 a	860.36 b

*5 cm = 140000 plants/fad.

** 10 cm = 70000 plants/fad.

c) Effect of the interaction between weed control treatments and plant distance on weeds

Data presented in Figures (6-9) demonstrated the effect of the interaction between plant densities and weed control treatments on fresh weight of some weed species at two stages of growth in two growing seasons. Results in Fig (6) revealed clearly that the effect of weed control treatments under investigation on weeds was not the same at the two plants densities. Results also indicated that narrower plant density (5- cm between plants) always decreased the fresh weight of weed species. This last finding hold fairly true for all weed species but the response was not the same with the herbicidal treatments under investigation. At the narrow plant density, no significant differences were detected

between hoeing, diphenamid and trifluralin treatments on fresh weight of *Portulaca oleraceae*, L, but the effect of these treatments at the wide distance between plants was great enough to reach the level of significance.

Similar responses could be illustrated with other weed species as well as with total fresh weight of the dominant weeds as shown in Figures 6 and 7.

The effect of the above interaction on fresh weight of weed species associated with soybean after 60 days from sowing are shown in Figures (8-9).

The obtained results indicated that the effect of weed control treatments on weed species was not the same under the two plant densities.

The effect of dinitramine, linuron and trifluralin on the fresh weight of *Amaranthus caudatus*, L. was the same at the wide distance between plants, but their effect was not the same under the narrow distance (fig 8).

It could be concluded that the significant effect of the interaction between weed control treatments and

plant densities on weeds or weed species revealed that the behavior of weed control treatments was not the same at the different plant densities. This was true for the two growing seasons as well as for the different stages of growth.

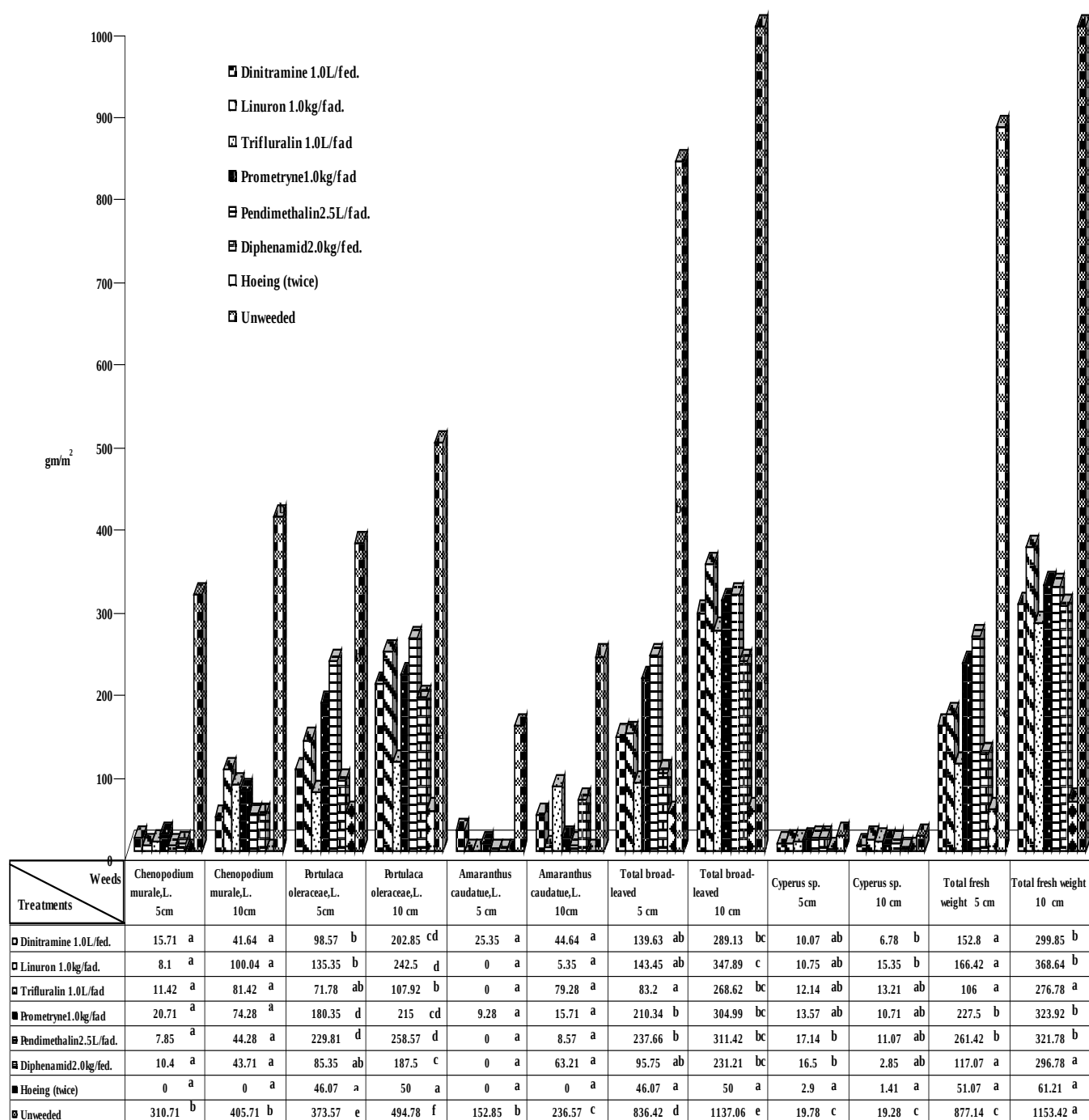


Figure 6 : Effect of the interaction between plant distance and weed control treatments on fresh weight of weed species after 30 day from sowing in 1st season (gm/m²)

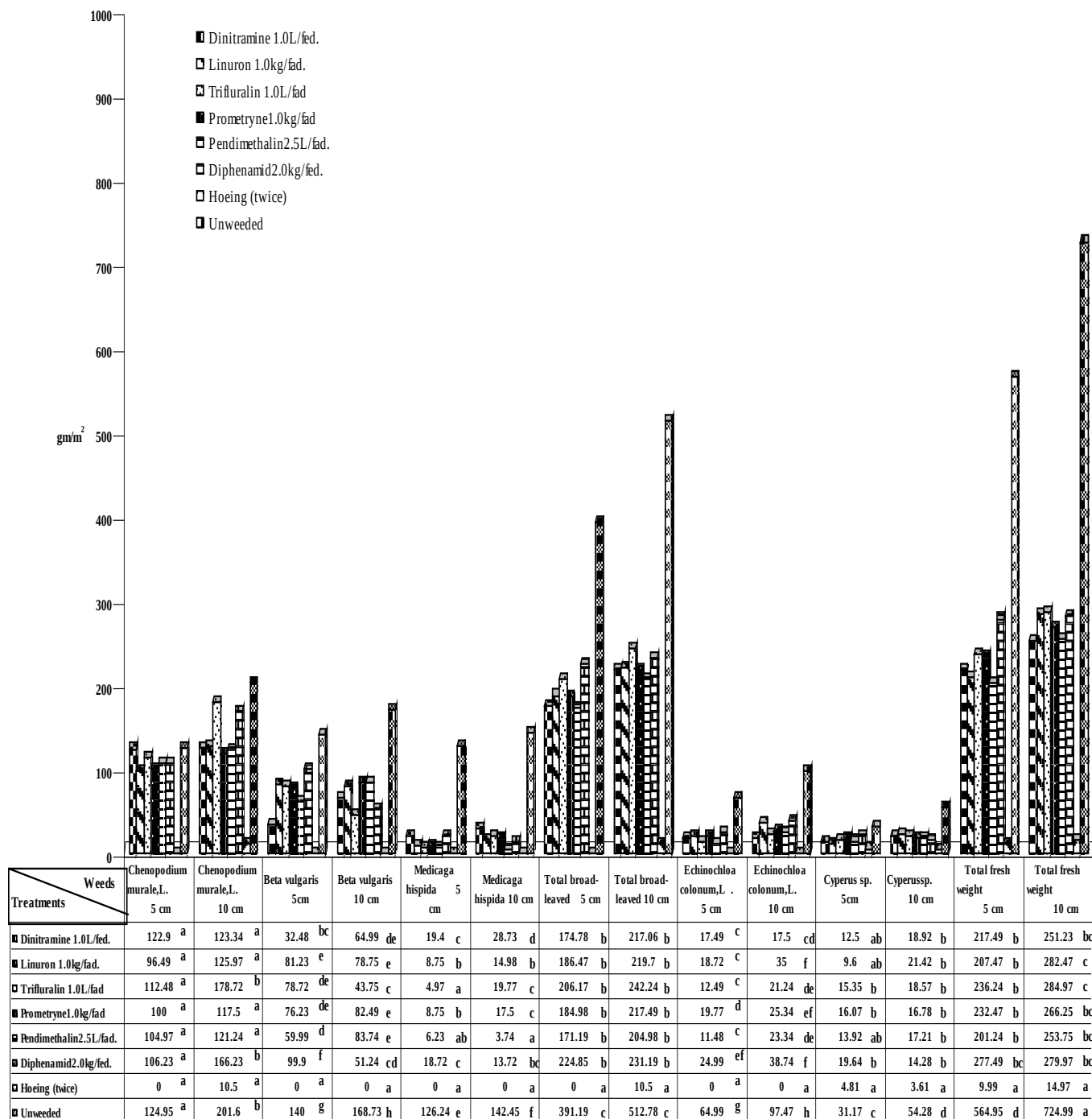


Figure 7 : Effect of the interaction between plant distance and weed control treatments on fresh weight of weed species after 30 day from sowing in 2nd season (gm/m²)

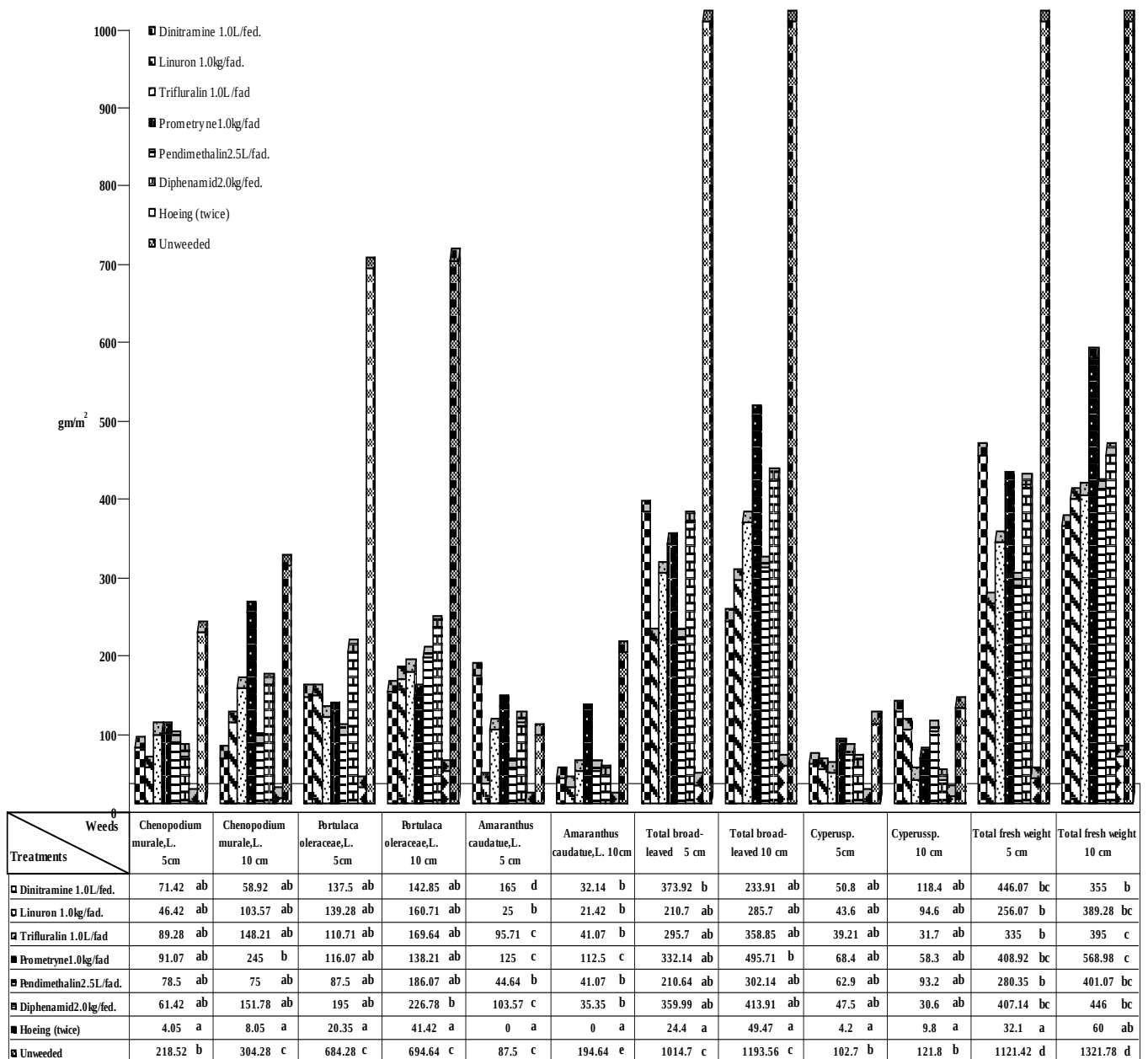


Figure 8 : Effect of the interaction between plant distance and weed control treatments on fresh weight of weed species after 60 day from sowing in 1st season (gm/m²)

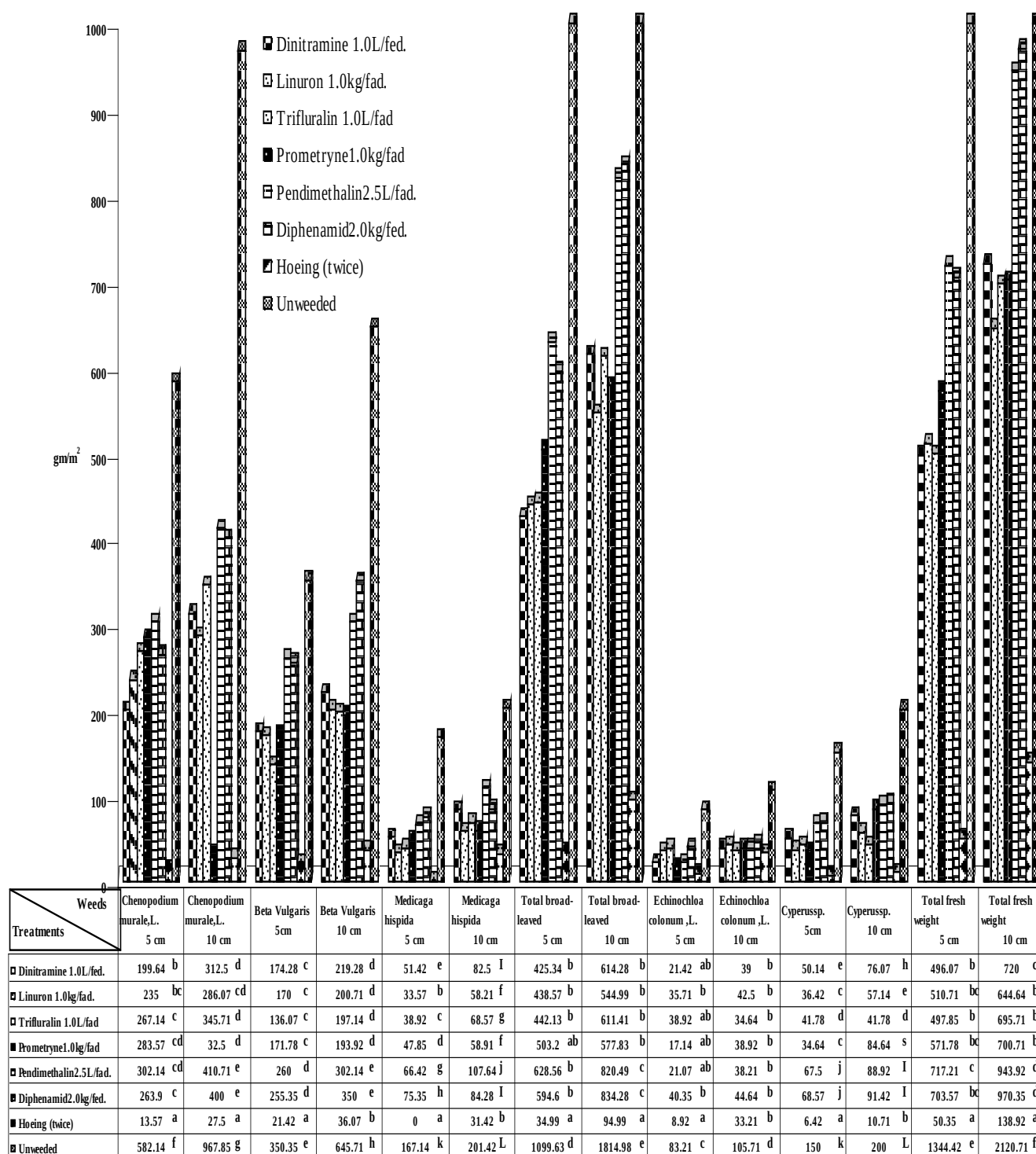


Figure 9 : Effect of the interaction between plant distance and weed control treatments on fresh weight of weed species after 60 day from sowing in 2nd season (gm/m²)

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- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.



- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently. You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.



Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.



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Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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