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CONTENTS

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WATER CONTENT OF SOME IRAQI DATES AT DIFFERENT STAGES OF MATURITY

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SUMMARY

The changes in water content of five varieties of Iraqi dates at different stages of maturity have been studied using the vacuum oven method. It was found that :

1. The water content of Iraqi Zahdi decreased from 84.20% in the green stage to 19% in the dry stage on September 23.
2. Iraqi Khadrawi showed a decrease in water content from 87% in the green stage to 11.10% in the dry stage.
3. The water content of Iraqi Sayir changed from 80% in the green stage to 9.70% in the dry stage.
4. In the case of Iraqi Berbin the changes in water content were investigated to 100% soft stage (rutab.) The percent of moisture decreased from 86.50% in the green stage to 49.80% in the rutab stage.
5. Samples of Iraqi Maktuum at different stages of maturity were taken on the same date; it was found that the water content decreased from 41.50% in yellow stage to 9.40% in the dry stage.

الخلاصة

أجريت دراسة حول التغيرات في نسبة الرطوبة أثناء مراحل النضج على خمسة أصناف من التمور العراقية وذلك باستعمال طريقة التسخين تحت ضغط منخفض · ولقد توصلت الدراسة الى النتائج التالية :ـ

١ ـ ان نسبة الرطوبة في التمر الزهدي العراقي انخفضت من ٨٤ر٢٪ في التمر الاخضر (غير ناضجة) الى ١٩٪ في التمر الجاف ·

٢ ـ اما الصنف الخضراوي فان نسبة الرطوبة فيه انخفضت من ٨٧٪ في التمر الاخضر الى ١١ر١٪ في التمر الجاف ·

٣ ـ في صنف السابر انخفضت نسبة الرطوبة فيه من ٨٠٪ في التمر الاخضر الى ٩ر٧٪ في التمر الجاف ·

٤ ـ في صنف البربن درست التغيرات في نسبة الرطوبة من مرحلة التمر الاخضر حيث كانت نسبة الرطوبة ٨٦ر٥٪ الى مرحلة الرطب (١٠٠٪ ناضج) حيث كانت نسبة الرطوبة ٤٩ر٨٪ ·

٥ ـ في صنف المكتوم درست التغيرات في نسبة الرطوبة في مراحل مختلفة من النضج تحت نفس الظروف ولقد وجد بأن كمية الرطوبة انخفضت من ٤١ر٥٪ في التمر الاصفر الى ٩ر٤٪ في التمر الجاف ·

INTRODUCTION

The importance of moisture on the chemical deterioration (Rygg, 1956 and Rygg, 1957), microbial spoilage (Cleveland, 1932 and Nielsen, 1950) and sugar spotting (Rygg, 1942) of fresh dates has been demonstrated. Of the moisture determination methods presently used for dates there are : the vacuum oven procedure (Maier, 1958) refractive index and electrical resistance- methods (Jacobs, 1958.)

Since little has been published on chemical changes that take place during the ripening of Iraqi dates, work was designed to study those changes. The first part of this work includes changes in water content of varieties of Iraq dates at different stages of maturity.

MATERIALS AND METHODS

A block of bearing palm trees located at the College of Agriculture in Abu Ghraib was used for this experiment.

The date varieties that used in investigation were Zahdi, Khadrawi, Sayir, Berbin and Maktuum. Three trees of each variety were used for sampling. Samples of approximately the size during different stages of maturity were taken from different bunches and from scattered positions at intervals of one or two weeks from the 17th of August until the 22nd of October.

Moisture Determination

Fifty fruits of each date variety were used. The perianths and seeds were separated and date meat was cut into small pieces and were mixed well. Exact weight of each sample (about five grams) was placed in weighed aluminum dish. The samples were dried for 22 hours at 70°C and 0 mm. pressure in a vacuum oven. At the end of the drying period, the dishes were removed from the vacuum oven, placed in a desicater, allowed to cool and weighed. Triplicate determinations were made for each sample. The average results of the moisture percentages as the percent of wet weight are reported in this work.

RESULTS AND DISCUSSION

The terms Khimri, Khalaal, Rutab and Tamar have been assigned for the stages of maturity of date in Mesopotamia. "Khimri" is the green fruit stage. The stage which includes full size and change in color to red or yellow is called "Khalaal'. The "Rutab" stage is characterized by a discoloration process to shades of either dirty brown or black, also by a a squashily texture and loose skin. The "Tamar" which is the last stage of maturity was described as the perfect dates.

In this work the terms green, yellowish-green, yellow, 25% soft, 50% soft, 100% soft, and dry were used for stages of maturity.

Data in Table (1) indicate that in the green stage the water content of Iraqi Zahdi on the 17th of August was 84.2% of the fresh weight. There were little changes in the moisture when the fruit reached the yellowish-green stage, whereas in the yellow stage, the percent of moisture dropped to 68.3. The decrease in the percentage of moisture was maximum when the fruits became dry (10.97.)

TABLE I

Changes in water content of Iraqi Zahdi during ripening.

Date of Sampling	Stage of ripening	% Moisture
August 17	Green	84.20
August 25	Yellowish-green	83.20
Sept. 9	Yellow	68.30
Sept. 16	50% soft	33.40
Sept. 23	Dry	19.02
Oct. 22	Dry	10.97

Similar results relating the percentages of moisture and the stages of ripening have been found in the case of Iraqi Khadrawi (Table II), nevertheless it can be seen from Tables I and II that both Zahdi and Khadrawi behave differently in each of these stages.

TABLE II

Changes in water content of Iraqi Khadrawi during ripening

Date of Sampling	Stage of ripening	% Moisture
August 17	Green	87.00
August 25	Yellowish-green	86.90
Sept. 9	Yellow	78.90
Sept. 16	50% soft	53.40
Sept. 23	100% soft	20.30
Oct. 22	Dry	11.10

Sayir (Istaamraan) has been found to contain 80% moisture in the green stage, 52.7% in the yellow stage and 39% in the 25% soft stage. However, the value has been dropped to 9.74% in the dry stage (Table III.)

TABLE III

Changes in water content of Iraqi Sayir during ripening

Date of Sampling	Stage of ripening	% Moisture
August 25	Green	80.00
Sept. 9	Yellow	52.70
Sept. 16	25% soft	39.00
Sept. 20	100% soft	23.00
Sept. 30	Dry	9.74

Table IV shows the water content of Iraqi Berbin at different stages of ripening. The main difference between Berbin and other varieties is the high percent of moisture in 100% soft stage (49.8%.) Dry stage is not include in Table IV, for most of the fruits fell down before reaching the dry stage.

TABLE IV

Changes in water content of Iraqi Berbin during ripening

Date of Sampling	Stage of ripening	% Moisture
August 17	Green	87.50
August 25	Green	87.40
Sept. 9	Red	68.50
Sept. 16	50% soft	55.70
Sept. 23	100% soft	49.80

Iraqi Maktuum samples at yellow, 50% soft and dry stages were picked up on the 22nd of October. The changes in the percentages of moisture are presented in Table V.

TABLE V

Changes in water content of the three kinds of Iraqi dates*

Variety	Stage of ripening	% Moisture
Zahdi	Yellow	56.70
	50% soft	36.20
	Dry	10.97
Berbin	Red	54.04
	50% soft	49.00
	100% soft	45.00
Maktuum	Yellow	41.48
	50% soft	30.20
	Dry	9.40

* Samples were collected on the same date-October 22, 1964.

Samples of Zahdi and Berbin at different stages of ripening were collected on the same date (date concerned for dry stage) to show if

there were differences between percentages of moisture on the dates referred to in Tables I and IV on one hand and Table V on the other. In the case of Zahdi, the difference is clear in the yellow stage, and in that of Berbin in the red stage.

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EFFECT OF BROADCAST SOWING DATES AND RATES OF SEEDING ON WHEAT YIELD AND OTHER AGRONOMIC CHARACTERISTICS

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SUMMARY

A split plot experiment, consisted of three dates of sowing and four broadcast sowing rates of Ajeba wheat, was applied at Abu-Ghraib irrigated Station. The highest rate of sowing (R_4) and the last date of sowing (D_3) caused increase in weight of straw and decrease in weight per 100 seeds. The best date of sowing (D_2) and the optimum rate of seeding (R_3) resulted in 34.25% increase in yield.

الخلاصـة

فى تجربة أحواض منشقة Split Plots مكونة من ثلاثة مواعيد زراعة واربعة كميات بذور نثرا باستعمال الحنطة العجيبة ومطبقة فى محطة ابى غريب الاروائيـة أدى استعمال أعلى كميـة بذور R_4 وآخر موعد للزراعة D_3 الى زيادة وزن القش (السيقان) ونقصان وزن ١٠٠ حبة . أدى أفضل موعد للزراعة D_2 مع أنسب كمية بذور R_3 الى ٣٥ و٣٤٪ زيادة فى الحاصل .

INTRODUCTION

Since most of the Iraqi farmers are still using the broadcasting method in sowing wheat, it was felt necessary to obtain information for the optimum date and rate of broadcast sowing local wheat. Although this study was made primarily for the central irrigated region of Iraq, where Ajeba wheat is the only variety in use, its results could be safely applied in the southern irrigated region also, due to similarity in environmental condition and cultural practices. Very little work has been done on the influence of sowing date and broadcasting rate of seeding irrigated wheat. Heavier seeding rate was recommended for late date of seeding (Bayles 1957 and Salmon and Taylor 1939.) The date of seeding was more important for securing maximum yield than rate of seeding (Robertson, Brandon, Fellows, Coleman and Curtis 1942.) Both dates and rates of sowing differ significantly in amount of yield produced. Rates within years showed a tendency to remain constant, but dates within years usually varied (Bayles 1957, Burlison and Handchin 1924, Salmon and Taylor 1939 and Woodward 1956.)

MATERIALS AND METHODS

Three dates of sowing : early (third week of October), middle (second week of November), and late (fourth week of November), where each date contained four rates of sowing 16, 24, 32 and 40 Kg. seed per acre were designed in a split plot experiment with four replications at Abu-Ghraib irrigated Station. The variety used was Ajeba 210 bread wheat. The duration of the experiment was four years (1958 to 1961.) The plot size for each treatment in each replication was 4 x 16 meters. Seeds were broadcasted by hand as usually done by Iraqi farmers. Date of heading, lodging score (1 erect, 10 flat), culm height in centimeters, and date of maturity were recorded from each plot. The plots were harvested by hand and threshing was done with a nursery thresher for obtaining weight of straw, grain yield in kilograms and weight per 100 seeds in gram. D_1, D_2 and D_3 designated the early, middle and late date of seeding, and R_1, R_2, R_3 and R_4 designated the 16, 24, 32 and 40 Kg of seeds per acre, respectively. The average yield in Kilograms was converted to bushel acre and analyzed statistically by using the analysis method of variance.

EXPERIMENTAL RESULTS

There was no important difference among seeding rates in regard to heading date and maturity, but there was rather great influence of seeding date on date of heading and maturity (Table 1, 2.) D_1 was 13 days

Table 1. Agronomic characteristics of the various dates and rates of sowing, average 1958—1961.

Treatments	Date of heading	Lodging score	Culm height cm.	Date of maturity	Weight of straw Kg.	Weight per 100 seeds gr.
D_1R_1	5/3	7.5	105	1/5	15.400	3.35
D_1R_2	2/3	7.5	112	1/5	15.700	3.65
D_1R_3	2/3	6.0	97	1/5	16.833	3.10
D_1R_4	2/3	7.5	114	1/5	17.474	3.50
D_2R_1	16/3	4.0	120	5/5	15.750	3.80
D_2R_2	16/3	4.0	120	5/5	16.070	3.40
D_2R_3	16/3	4.0	114	5/5	16.888	3.65
D_2R_4	16/3	5.5	113	5/5	18.417	3.25
D_3R_1	31/3	5.5	116	9/5	13.417	3.20
D_3R_2	31/3	5.5	116	9/5	14.700	2.90
D_3R_3	31/3	5.5	118	9/5	14.333	3.15
D_2R_4	31/3	5.5	115	9/5	18.666	2.95

Table 2. Agronomic characteristics for dates and rates of sowing, average 1958—1961.

Treatments	Date of heading	Lodging score	Culm height cm.	Date of maturity	Weight of straw Kg.	Weight per 100 seeds gr.
D_1	3/3	7.1	107	1/5	16.352	3.50
D_2	16/3	4.4	117	5/5	16.781	3.53
D_3	31/3	5.5	116	9/5	15.279	3.05
R_1	17/3	5.7	114	5/5	14.856	3.45
R_2	16/3	5.7	116	5/5	15.490	3.32
R_3	16/3	5.2	110	5/5	16.018	3.30
R_4	16/3	6.2	114	5/5	18.186	3.23

ahead of D_2 and D_2 was 15 days ahead of D_3. D_1 matured 4 days earlier than D_2 and D_2 matured 4 days earlier than D_3. There was not much variation in culm height among dates or rates of sowing. Seeding dates varied in lodging score, where D_2, D_3 and D_1 gave average lodging score of 4.4, 5.5 and 7.1, respectively. Rate of seeding within dates did not vary in lodging score. The rate of increase in weight per 100 seeds for D_1 and D_2 in comparison to D_3 was 14.75% and 15.74%. The rate of increase in weight per 100 seeds for R_1, R_2 and R_3 in comparison to R_4 was 6.81%, 2.79% and 2.17%. D_2 and D_1 produced 9.83% and 7.03% higher weight of straw than D_3. R_4, R_3 and R_2 produced 22.42%, 7.82% and 4.27% higher weight of straw than R_1.

Analysis of variance on the yield data (Table 3), showed that years, dates, dates x years were highly significant, where dates responded differently in different years. Rates were significant and rates x years were

Table 3. Yearly average yield in bu/acre and percentage increase for the various dates and rates of broadcasting sowing Ajeba bread wheat.

Treatment	Y_1 57–58		Y_2 58–59		Y_3 59–60		Y_4 60–61		Average	Grand	Average
	$\bar{X}$	% of check	$\bar{X}$	% of check	$\bar{X}$	% of check	$\bar{X}$	% of check	% of check	$\bar{X}$	% of check
D_2	32.27	125.96	34.83	155.35	34.50	123.08	22.36	100.81	126.18	31.00	126.17
D_3	29.32	114.44	33.01	147.23	33.68	120.16	16.50	74.39	114.54	28.12	114.45
D_1	25.62	100.00	22.42	100.00	28.03	100.00	22.18	100.00	100.00	24.57	100.00
R_4	30.22	110.66	30.71	107.75	33.58	107.63	22.29	123.08	111.11	29.20	111.07
R_3	32.27	118.16	31.31	109.86	31.44	100.77	22.33	123.30	111.64	29.34	111.79
R_2	26.46	96.89	29.90	104.91	32.06	102.76	18.71	103.31	101.90	26.78	101.79
R_1	27.31	100.00	28.50	100.00	31.20	100.00	18.11	100.00	100.00	26.28	100.00

not significant, indicating that the rate yearly variation was constant. There was highly significant difference between years (Y_3) and (Y_1, Y_2, Y_4), but no significant difference among Y_1, Y_2 and Y_4, which indicates that Y_3 was very exceptional. The average yield for D_1, D_2 and D_3 in Y_1, Y_2, Y_3 and Y_4 is presented in Table 3. There was significant difference among D_2, D_3 and D_1 with 126.17% and 114.45% of D_1 respectively. The linear trend of rates (R) was significant at .01 level but none of the additive quadratic (R) or additive cubic (R) showed any significant trend indicating that increase in yield resulted from increase in sowing rate from R_1 to R_3. R_4 and R_3 did not differ significantly, but each differed significantly from R_2 and R_1. R_2 vs. R_1 were not significantly different. R_4, R_3 and R_2 averaged 111.07%, 111.79% and 101.79% of R_1, respectively. The average r value between yield and weight per 100 seeds was 0.958, which was highly significant. The average r between yield and weight of straw was 0.628, which was significant. The average r between culm height and straw weight was 0.355, which was not significant.

DISCUSSION

Dates of sowing have shown influence on heading date and maturity, lodging score, weight per 100 seeds and weight of straw, but did not show effect on culm height. Rates of seeding have shown influence on weight of 100 seeds and weight of straw, and did not show influence on date of heading and maturation, culm height and lodging score. The highest rate of seeding caused increase in weight of straw and decrease in weight of 100 seeds. The rate of increase in yield by using the best date of sowing (D_2) and the optimum rate of sowing (R_3) was 34.25%. Dates behaved differently in different years, but rates behaved similarly in each year. These results agreed with results obtained by (Rayles 1957, Burlison and Handchin 1924, Salmon and Taylor 1939 and Woodward 1956.) The increase in yield resulted in increase in weight of 100 seeds and higher weight of straw. The increase in straw weight was not tied up with increase in culm height.

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A STUDY OF HERITABLE TRAITS IN TWO LOCAL VARIETIES OF ALFALFA

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SUMMARY

Two local alfalfa varieties were studied in a spaced nursery for recovery after cutting, erectness, resistance to cold, vigor and yield of green forage. The results indicated that the two varieties were distinctly different in the first trait but were about equal in other characteristics. In general, Hijazi variety was superior.

الخلاصة

درست أفراد من نباتات صنفي الجت المحلي المسميان هندي وحجازي من ناحية سرعة النمو بعد القص ، وانتصاب الساق ، ومقاومة البرد وغزارة النمو وكمية المحصول الاخضر ، وقد وجد ان هناك تفاوت بين الصنفين خاصة في سرعة النمو بعد القص ولوحظ أن الجت الحجازي كان بصورة عامة متفوق على الهندي في أغلب الصفات .

INTRODUCTION

Some of the main features which make alfalfa superior to other forage crops are : its high yield of good quality forage, its tolerance to salts in the soil, its ability to improve the soil in crop rotations and competes well with weeds. With long growing season and sufficient moisture, alfalfa can be a very profitable crop in Iraq. J. van der Veen (1959) reported that alfalfa in Iraq gave 20—30 tons of green forage per donum per year.

As far as known, the number of local alfalfa varieties in Iraq, their history, origin and characteristics have not been reported. J. Van der Veen (1959) compared introduced varieties of alfalfa with local material and found the latter to "give as high or higher yields than the introduced varieties". He failed, however, to mention in his report the names of local varieties and gave no yield data.

The objective of this investigation was to compare two local alfalfa varieties in a spaced nursery for some of their heritable traits. Such information can be of value for those who intend to establish breeding programs to improve local alfalfa varieties. The results of this study are presented in this report.

MATERIALS AND METHODS

Small seed samples of the local alfalfa varieties, Hindi and Hijazi, were obtained through the courtesy of Dr. Jamal Fo'ad, Head of the Crops

Division, Agricultural Experiment Station, Ministry of Agriculture, Abu Ghraib, Iraq. The seeds were sown in pots in the greenhouse at the College of Agriculture on Oct. 21, 1962. Seedlings were transplanted into a spaced nursery in the field on March 25, 1963. Transplanting was in alternate rows for the two varieties. Spacing was one-meter between and within rows. Each row contained 13 plants. Replanting was made several times to replace dead plants.

During two growing seasons these plants were studied individually for the following traits : recovery after cutting, erectness, resistance to cold, vigor and yield of green forage. Except for yield which was measured in grams, all other traits were visually estimated, using a 1—5 scale, with the lower score being best.

RESULTS AND DISCUSSION

The number of plants which survived in the field and were evaluated for the above mentioned traits were 70 and 68 plants from the Hijazi and Hindi varieties, respectively. The data recorded on these plants are given in the table below.

Mean performance of 70 plants of Hijazi and 68 plants of Hindi alfalfa varieties evaluated for indicated traits in a spaced nursery. Evaluation of the traits was based on a 1—5 scale with 1 being best except yield which was estimated in grams per plant.

Trait	Season	Variety	
		Hindi	Hijazi
Recovery after cutting	1963	3.84	2.81
Recovery after cutting	1964	3.08	2.49
Erectness	1963	2.61	2.68
Erectness	1964	2.82	2.84
Resistance to cold	1964	3.34	3.63
Vigor	1964	3.22	2.82
Yield of green forage (grams)	1964*	327.50	373.70

* Yield was mean of 4 cuttings made in 1964.

From the table above it was evident that recovery after cutting, was remarkably different in the two varieties. In this case Hijazi was superior to Hindi and the results were consistant. Erectness and resistance to cold were about the same in both varieties. In general, the Hijazi variety was slightly better than Hindi in vigor and yield.

One of the problems of alfalfa production in Iraq is the alfalfa weevil **(Hypera Postica)** which inflicts severe damage in the spring. First hand observation in this study indicated that both varieties were susceptible to this pest. Searching for resistant individual plants in local material offers a good possibility for control.

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THE PHYSICAL PROPERTIES OF FOUR IRAQI SOILS

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SUMMARY

The physical properties of four Iraqi soils were studied. Soil moisture tension curves were drawn for these soils. It was found that the field capacity and the wilting percentage increase with the clay content. The percent of the large pore spaces was low compared to the small pore spaces. The bulk density increases with depth and the total porosity decreases accordingly.

الخلاصة

درست الخصائص الفيزيائية لاربع ترب عراقية ورسمت منحنيات الشد الرطوبى لهـذه الترب ووجد أن رطوبة التربة فى السعة الحقلية ونقطة الذبول تزداد بازدياد نسبة الطين فى التربة . كانت النسبة المئوية لاحلية المسام الكبيرة الحجم قليلة بالمقارنة مع أحليـة المسام الصغيرة الحجم . تزداد الكثافة الظاهرية للتربة مع العمق وتقل تبعا لذلك مساميتها .

INTRODUCTION

The physical characteristics of Iraqi soils have not been under systematic consideration until Recently. Its importance is felt when the new irrigation and drainage projects are implemented in the country. For this reason it is necessary that a preliminary research work should be carried out to characterize a few facts of the fundamental physical properties of Iraqi soils in order that reliable estimates of these parameters could be provided to fasten the programmes of the applied fields of irrigated agriculture.

Soil moisture is best expressed in terms of tension within the range of 0.001 atm. up to 10000 atm. Kohnke (1946) reported that aeration porosity limit lies at 0.05 atm. It is known that plant roots make use of capillary water between the field capacity (1/3 atm.) and the wilting point (13.6 atm) as reported by Richard and Weaver (1944) and Kohnke (1946).

MATERIALS AND METHODS

For the determination of soil moisture tension and other physical properties considered in this study undisturbed soil cores 4 cm. long and 5.6 cm. in diameter were used. The tension table method was followed as described by Kohnke (1956). The field capacity and the wilting point were determined by the use of the pressure plate and membrane apparatus as described in the U.S.D.A. Handbook No. 60 (1954).

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The porosity of the soil was calculated from the soil moisture tension curve of the studied soils. The bulk density was expressed in gm/cc. on the oven dry basis. The pipette method was used for the textural determination of the soils. The electrical conductivity of the saturated extract was also determined.

Samples were taken from three sites of each soil series and at three depths 0—4, 4—8, and 8—12 cm.

The four soils studied were the Abu-Ghraib clay loam, the Abu-Sefy sandy clay loam, the Aqarquf silty clay, and the Aqarquf silty clay loam. The second soil represents the irrigated levee soil, and the other three soils were classified by Al-Rawi (1965) as basin soils. Table 1 shows the mechanical analysis of these soils.

Table 1. Mechanical analysis of four Iraqi soils at three depths

Soil Series	Depth in cm.	% Sand	% Silt	% Clay	Textural class
A 1					
Aqarquf					
silty clay	0 — 4	1.0	47.0	52.0	SiC
	4 — 8	1.0	46.0	53.0	SiC
	8 —12	0.9	44.0	55.0	SiC
A 2					
Aqarquf silty					
clay loam	0 — 4	1.0	46.0	53.0	SiC
	4 — 8	1.0	46.0	55.0	SiC
	8 —12	1.0	43.0	56.0	SiC
B 2					
Abu Ghraib					
clay loam	0 — 4	9.0	51.0	40.0	SiCL
	4 — 8	8.0	53.0	39.0	SiCL
	8 —12	10.0	50.0	40.0	SiCL
C 4					
Abu-Sefy sandy					
clay loam	0 —4	6.0	50.0	44.0	SiCL
	4 — 8	11.0	54.0	35.0	SiCL
	8 —12	21.0	46.0	33.0	CL

RESULTS AND DISCUSSION

The percent of moisture at the wilting point is higher in A1 and A2 than in B2 and C4 as shown in Table 2. This is because of the high clay

Table 2. Soil moisture tension of four Iraqi soils at three depths.

Soil series	Depth in cm.	Percent of moisture by volume				
		Saturation	.05 atm.	1/3 atm.	13.6 atm.	Available
A 1						
Aqarquf silty						
clay	0 — 4	58.86	42.94	40.98	22.21	18.77
	4 — 8	55.45	45.14	42.31	24.34	17.98
	8 —12	54.33	48.61	45.06	20.91	24.15
A 2						
Aqarquf silty						
clay loam	0 — 4	62.87	43.93	36.89	21.60	15.29
	4 — 8	56.88	43.67	39.89	19.47	20.42
	8 —12	55.89	42.17	39.29	23.43	15.86
B 2						
Abu-Ghraib						
clay loam	0 — 4	55.05	40.03	32.96	15.73	17.23
	4 — 8	47.90	37.38	33.86	15.60	18.26
	8 —12	51.23	39.86	34.46	15.48	18.68
C 4						
Abu-sefy sandy						
clay loam	0 — 4	60.15	41.51	32.72	15.15	17.57
	4 — 8	50.05	39.85	35.49	15.63	19.87
	8 —12	54.88	38.49	34.97	15.19	19.78

content in the first two soils. However the available moisture was closely related in all four series. The soil moisture at field capacity (1/3 atm.) is higher in A1 and A2 than in B2 and C4 for the same reason.

Figures 1 to 4 clearly indicate the moisture relationship drawn on semi logarithmic scale for the four

soils included in this study. These curves were extrapolated beyond the wilting point because the lack of suitable equipment.

Table 3 shows that the total porosity of all the soil series studied ranges from about 48 to 60%. This is considered as an average for these soils. However, the large pore spaces are rather low in percentage (5.75 to 18.84%) compared to the small pore spaces (34.76 to 52.22%).

Table 3. Porosity and Bulk density of four Iraqi soils at three depths.

Soil series	Depth in cm.	Bulk density	Percent of Porosity		
			Large pore spaces	Small pore spaces	Total pore spaces
A 1					
Aqarquf silty					
clay	0 — 4	1.07	15.98	43.15	58.41
	4 — 8	1.20	10.33	45.28	54.58
	8 —12	1.23	5.75	52.22	53.45
A 2					
Aqarquf silty					
clay loam	0 — 4	1.08	18.84	43.01	59.84
	4 — 8	1.13	13.22	43.74	57.29
	8 —12	1.15	13.22	42.90	56.30
B 2					
Abu-Ghraib					
clay loam	0 — 4	1.23	15.05	40.12	53.33
	4 — 8	1.27	13.91	37.54	51.72
	8 —12	1.33	10.05	34.76	48.16
C 4					
Abu-Sefy sandy					
clay loam	0 — 4	1.21	15.33	41.62	54.44
	4 — 8	1.32	10.42	39.54	50.46
	8 —12	1.32	10.27	44.86	49.66

It could be noted that the total porosity of some of these soils is somewhat lower than the summation of the large and small pore spaces. This is attributed to the oversaturation of these soils which is related to the high concentration of the clay fraction in the soils. The total porosity decreases with depth due to the increase in the bulk density.

The salt content of B2 and C4 is very high as shown in Table 4. This is directly related to the fact that these soils were left fallow during the past few years. The low salt content of A1 and A2 can be explained as being a result to the cultivation of these soils at the present.

More detailed work will be carried out in the future to determine other physical criteria of the farm soils both for the topsoil and deeper subsoil layers thereof.

Table 4. Electrical conductivity of four Iraqi soils at three depths.

Soil series	depth in cm.	EC/25°C mmhos/cm.
A 1		
Aqarquf silty clay	0 — 4	1.20
	4 — 8	1.13
	8 —12	1.10
A 2		
Aqarquf silty clay loam	0 — 4	1.89
	4 — 8	1.56
	8 —12	1.87
B 2		
Abu-Ghraib clay loam	0 — 4	31.38
	4 — 8	13.83
	8 —12	18.73
C 4		
Abu-sefy sandy clay loam	0 — 4	35.0
	4 — 8	18.23
	8 —12	10.16

ACKNOWLEDGMENT

The investigators wish to express their thanks to Miss F. Ibrahim and Mr. M. Al-Ani for their help in the course of this study.

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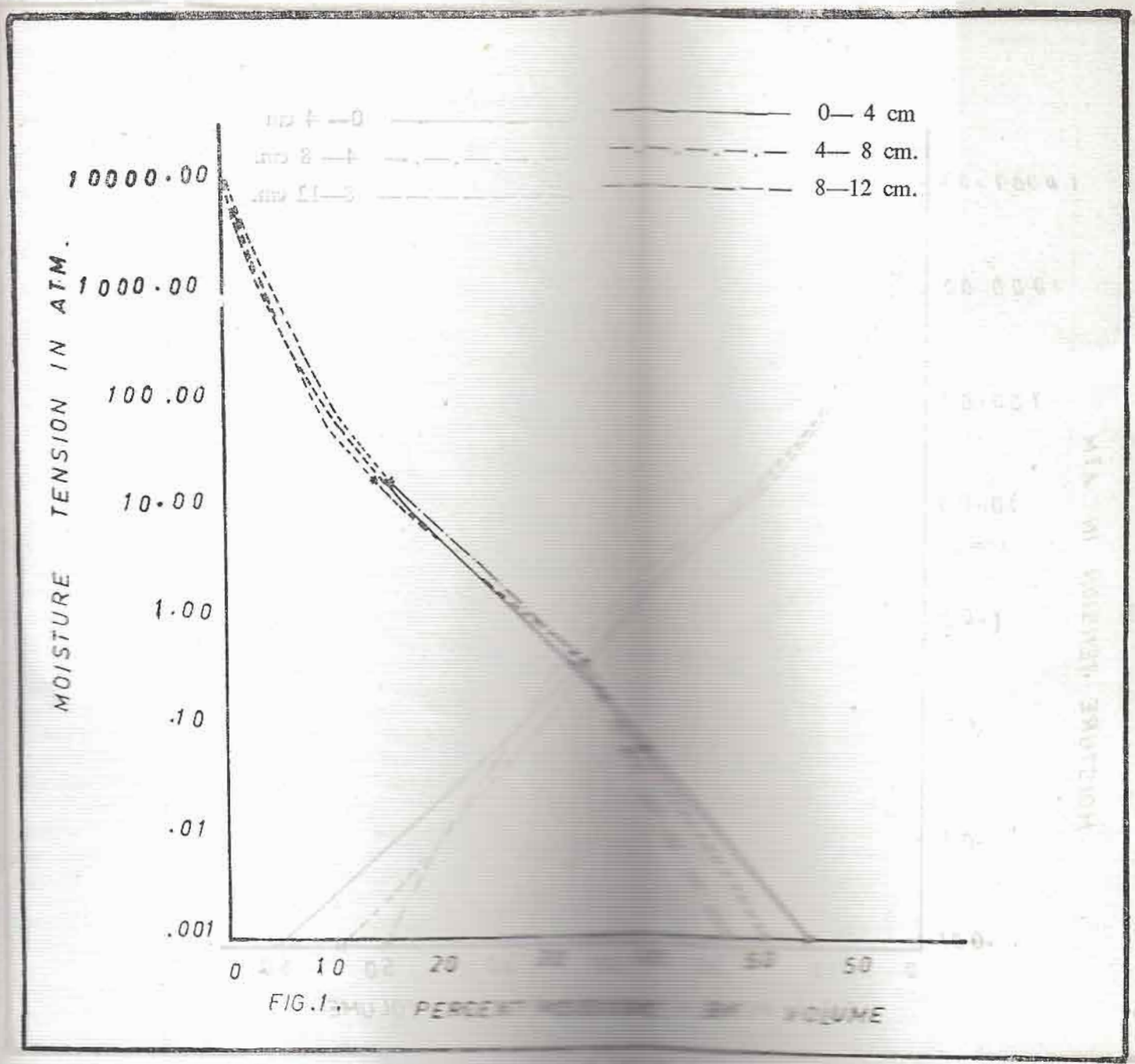
0— 4 cm
4— 8 cm.
8—12 cm.
MOISTURE TENSION IN ATM.
10000·00
1000·00
100·00
10·00
1·00
·10
·01
·001
0
10
20
50
FIG. 1.

Fig. 1.

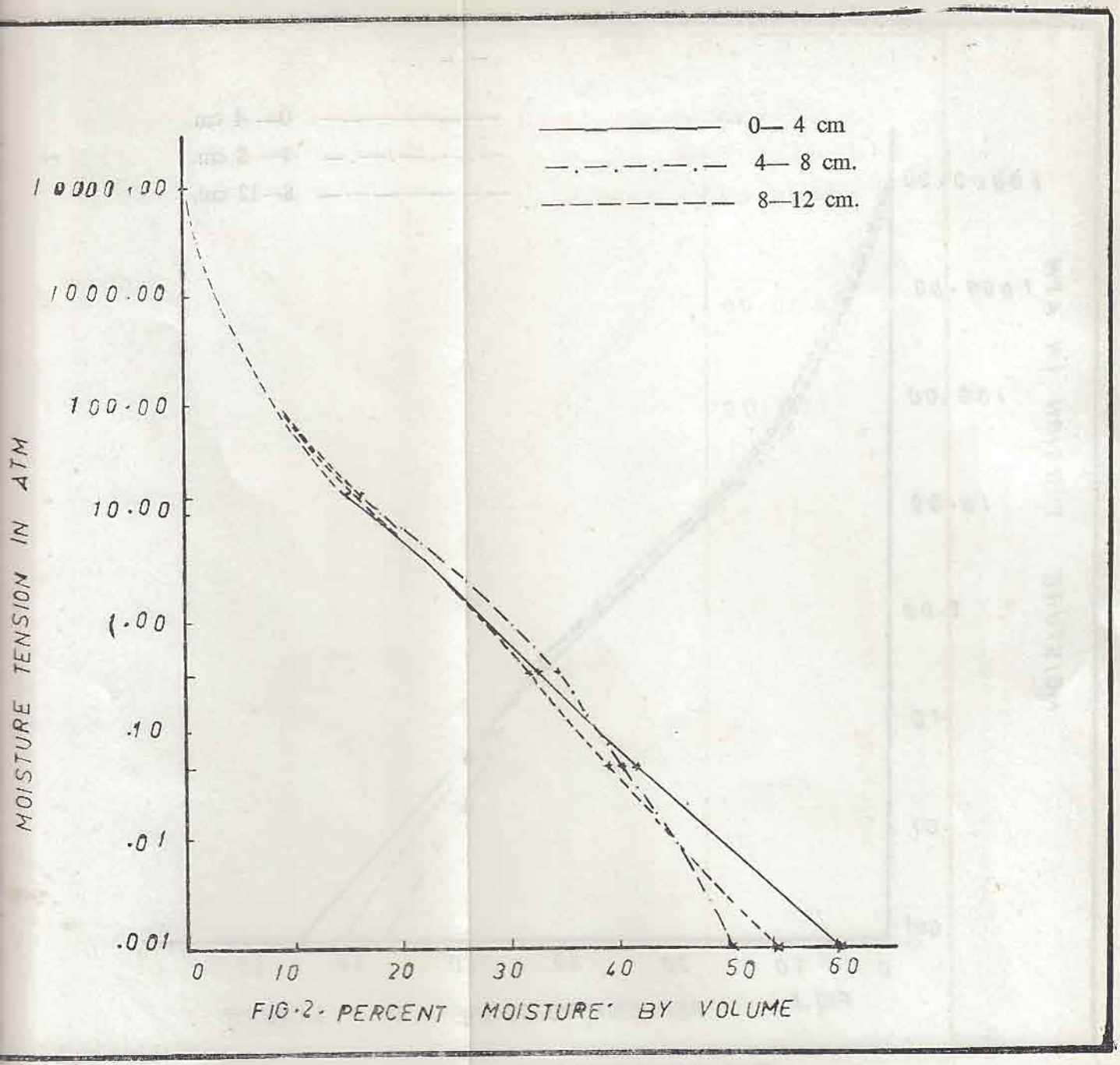

Fig 2. Soil moisture tension for Abu-Sefy Sandy clay loam.

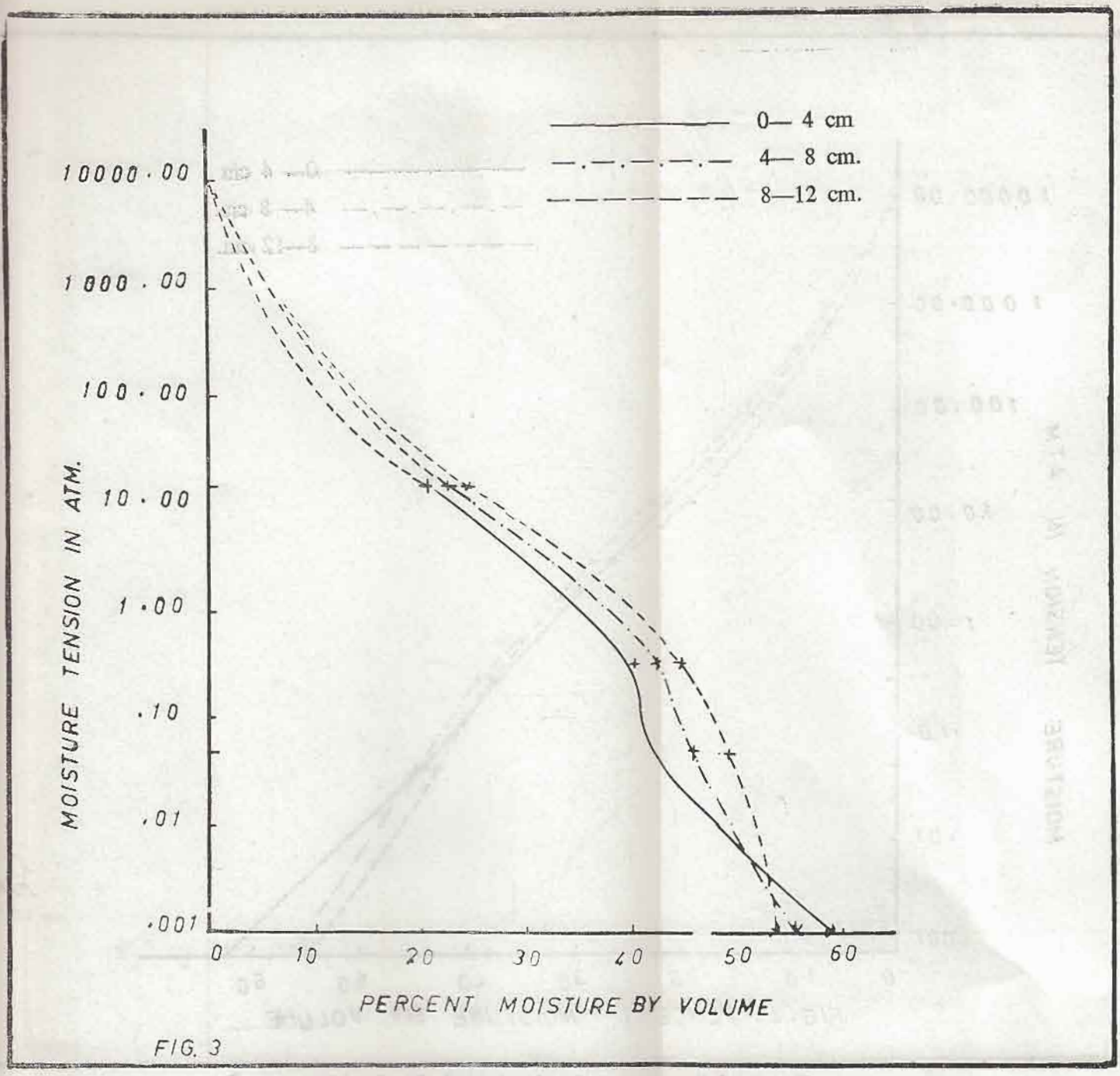

Fig. 3. Soil moisture tension for Aqarquf Silty clay.

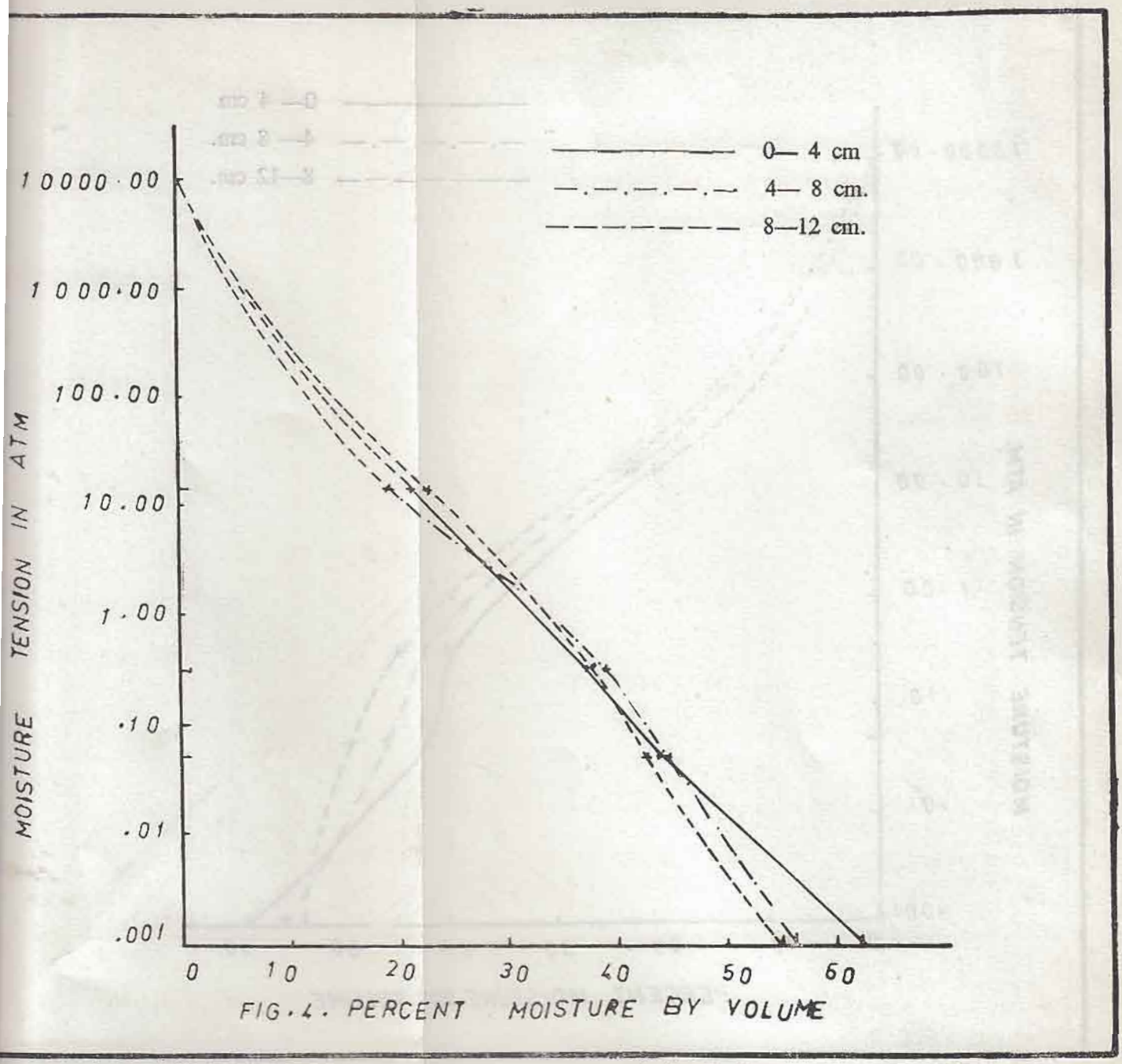

Fig. 4. Soil moisture tension for Aqarquf silty clay loam.

THE EFFECT OF FOUR TIMES A DAY MILKING ON MILK YIELD AND FAT CONTENT OF COWS MILK

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SUMMARY

Milking four times a day at 6-hour milking intervals beginning at 5 : 30 a.m. showed that the milk yield was increased during the second and third milking intervals. The greatest quantity of milk was produced during the third milking interval by the cows which were on pasture.

Milking four times a day compared with twice a day over two weeks period caused an increase of about 30% milk yield.

The highest butterfat content was found in the upper portion of the milk produced at 11 : 30 a.m. by cows which were kept in barns during the experiment.

Results obtained from this experiment encouraged the practice of milking three times a day instead of twice daily. This may be explained by the fact that cows have a small udder capacity which does not require more than eight hours for full milk secretion. It is hoped that this practice will reduce the dry period, because of a continuous stimulation of milk secretion.

الخلاصة

أدى حلب بعض ابقار قطيع الكلية اربع مرات يوميا على اساس ست ساعات للفترة بين الحلبة والاخرى الى زيادة في كمية الحليب الناتجة يوميا . وان اكبر كمية من الحليب جاءت في الحلبة الثالثة من الابقار التي كانت في المرعى . لقد كانت الزيادة في كمية الحليب الناتجة من حلب الابقار ثلاث مرات في اليوم حوالي ٣٠٪ بالمقارنة مع حلب الابقار مرتين في اليوم وان اقصى نسبة للدهن المأخوذ من الجزء العلوي من الحليب جاءت من الحلبة الثانية للابقار التي كانت في الاصطبل .

شجعت هذه النتائج على حلب الابقار ثلاث مرات في اليوم بدلا من مرتين وذلك للاستفادة من الزيادة في كمية الحليب الناتجة التي يمكن تفسيرها الى صغر ضرع البقرة الذي لا يحتاج الى اكثر من ٨ ساعات بين الحلبة والاخرى لامتلاءه . وهذا قد يساعد على زيادة فترة اعطاء الحليب لاستمرار عملية افرازه .

INTRODUCTION

The effect of milking intervals on the rate of milk secretion and fat content is important in a number of management and feeding practices. Koshi and Peterson (5) stated that milk secretion rate was 10.7% greater for the 10 hour milking interval than the 14 hour milking interval. Donker **et al** (3) reported that yields of milk were high in the first 4 hours. The fat secretion rate was particularly higher after an early period of low secretion when the intervals between milkings were increased step-wise up to 16 hours and total milk secretion was not changed from hourly rate until the intervals reached 16 hours. According to Bailey **et al** (1), the rate of secretion of both milk and fat declined with increase in milking intervals and milk yield in any interval was influenced by only one preceding milk interval, whereas fat yield varied with two or three preceding milking intervals.

Balch **et al** (2), studied the effect of diet low in hay and high in concent-

rates. He reported that decrease in milk fat content is found only with diet contained large amounts of starch.

Schmidt (6), presented evidence showing that the rate of milk fat and solids-not-fat secretion was linear for intervals up to and including 12 hours. Significant reduction in rates of secretion of these components were found at 16 and 20 hours intervals.

Elliott (4), stated that milking three times a day compared with twice a day over a 39 day period resulted in an increase of 12% in both milk and butterfat yield. Increasing the residual milk by 1 lb. in each half-udder, for a 39 day period caused a 15% decrease in both milk and butterfat yields.

Schmidt and Trinberger (7), indicated that no significant difference occurred in the milk fat and total solids percentage or yield in any two groups of unequal milking intervals.

EXPERIMENTAL PROCEDURES

Six crossbred Holstein cows, two at the beginning of their lactation, two in the middle of their lactation and two at the end of their lactation were selec ted at random from the College herd. Two cows only were selected because of the small number of cows in the College herd. The selected cows were under experimental observation for a period of two weeks in the barn and two weeks in the pasture. While in the barn the cows were fed four pounds of concentrates (16% crude protein) each before each milking, and green feed, mostly alfalfa, as free choice. While in the pasture the cows grazed mixed green feed, mostly alfalfa, for a period of eight hours a day and the same amount of concentrates was given to each cow before every milking.

The cows were machine milked four times daily with six hour milking intervals, starting at 5:30 a.m. The trial period before the experiment showed that the average milking time for the College herd was ten minutes. The milk obtained from each udder during the first five minutes milking was weighed and samples were taken for fat determination. This is referred to in the experiment as the lower portion of the total milk of the udder. The milking process was continued for the second five minutes to obtain the upper portion of the milk of the udder. It was also weighed and samples were taken for fat determination. All samples were analysed for fat content by the Gerber method. Therefore, this investigation was undertaken for the following objectives :-

1. To investigate the effect of four times a day milking on milk yield and butterfat content as influenced by method of feeding and lactation period.
2. To estimate the time required for maximum milk production which can be obtained from cows under College environmental conditions.

RESULTS AND DISCUSSION

The means milk yield and butterfat percentage produced by each group of cows at each milking interval while in pasture and in barn are reported in Tables 1 and 2.

Table 1. Means of twice and four times a day milk yield of each group of cows while in barn and in pasture.

Milking Time	Average milk yield — lbs. In Barn			In Pasture		
	A	B	C	A	B	C
Twice a day*	20.51	18.74	18.02	24.22	22.51	21.65
Four times a day:						
5:30 a.m.	5.64	6.60	5.76	7.31	7.45	6.95
11:30 a.m.	6.91	6.72	5.61	7.91	7.62	6.89
5:30 p.m.	7.41	6.75	6.15	8.25	8.12	7.15
11:30 p.m.	7.05	6.35	5.56	8.31	7.40	7.05
Total	27.01	26.42	23.08	31.78	30.59	28.04

* Average production of ten days in barn and ten days in pasture before the experiment.

A — Cows at the beginning of lactation.
B — Cows in the middle of lactation.
C — Cows at the end of lactation.

Data in Table 1 show that more milk was produced while the cows were on pasture than in the barn. Analysis of variance showed the difference to be highly significant. The data also show that cows at the beginning stages of lactation produced more milk than those in the middle and end of lactation respectively. The quantity of milk produced by each group during different milking intervals indicated an increase in the quantity of milk during the second and third milking intervals and a decrease in the quantity of milk during the fourth milking intervals. This may be due to the effect of the residual milk and the difference in the amount of oxytocine hormone released by the pituitary gland.

The means of milk yield for the three groups of cows of twice a day milking before the experiment were 20.51, 18.74 and 18.02 lbs. respectively while in barn, and 24.22, 22.51 and 21.65 lbs. respectively while in pasture. Comparing these values with the data reported in Table 1, an increase of over 30% in milk yield is noticed.

These results encouraged the practice of three times a day milking instead of twice daily which resulted in more milk production. It is hoped that the lactation period for the same cows will be longer than the preceding lactation.

Table 2. Mean butterfat percentage of milk produced by each group of cows while in barn and in pasture.

Milking Time	In Barn			In Pasture		
	A	B	C	A	B	C
Average butterfat percentage — upper portion						
5:30 a.m.	3.6	3.56	3.6	4.2	3.6	3.6
11:30 a.m.	5.8	5.64	5.0	5.4	5.0	4.9
5:30 p.m.	5.2	4.90	4.8	4.8	4.7	4.8
11:30 p.m.	3.5	3.40	3.7	4.3	3.6	3.7
Average butterfat percentage — lower portion						
5:30 a.m.	2.4	2.4	2.3	2.8	2.9	2.5
11:30 a.m.	4.3	4.6	4.2	4.1	4.4	4.2
5.30 p.m.	4.0	4.3	3.8	3.8	4.3	3.8
11:30 p.m.	2.3	2.2	2.2	2.8	2.7	2.5

A — Cows at the beginning of lactation
B — Cows in the middle of lactation
C — Cows at the end of lactation

Data reported in Table 2 show the average butterfat percentage found in the upper and lower portion of the milk produced by the three groups of cows at different milking intervals while in pasture and in barn. The data show that the upper portion of the milk, as a whole, contained more fat than the lower portion.

Microscopical examination of the milk fat globules of the upper portion of the milk revealed that over 80% of the milk fat globules are of 10 microns or more. The lower portion of the milk showed to contain mostly small fat globules of 5 microns or less.

Data in Table 2 also indicate that milk produced at the second milking interval by group A while in barn contained the greatest butterfat percentage. This showed to be highly significant. The butterfat percentage began to decrease during the third milking interval which indicates the decrease in the effect of the residual butterfat. The decrease in the butterfat percentage was more noticeable during the fourth milking interval.

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EVALUATION OF TOMATO PASTES AND RECOMMENDED METHODS FOR THEIR COMMERCIAL PRODUCTION

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SUMMARY

A great number of tomato pastes are available in the market and they are, almost all, sold for the same price, regardless of color, flavor, percent salt added, solid content, and viscosity.

Viscosity of tomato pastes depends, mainly, on the amount of gums present and not on the concentration of tomato solids. Gums can be either added to tomato pastes or extracted from tomatoes during manufacturing processes. Heating of cut tomatoes just before juice extraction helps to extract these gums and causes an increase in the viscosity of tomato paste produced. This practice is recommended to tomato paste producers, such as Kerbala Canning Factory to improve the product and expand their sales.

الخلاصـــة

تباع جميع أنواع المعجون المتوفرة في الاسواق المحلية باسعار مماثلة رغم تباينها في اللون والطعم واللزوجة ونسبة الملح المضاف والمواد الصلبة ·

ولقد وجد أن اللزوجة تعتمد بالدرجة الاولى على كمية الصموغ الموجودة في المعجون وليس على كمية المواد الصلبة · ويمكن اضافة الصموغ الى المعجون صناعيا أو استخلاصها من الطماطة نفسها عنـــد تصنيعها · وان تسخين الطماطة قبل عصرها يساعد على استخلاص الصموغ وبالتالي زيادة لزوجـــة المعجون الناتج ·

ونحن نوصي باستعمال هذه الطريقة في معامل صناعة المعجون كمعمل التعليب في كربلاء لتحسين المعجون الناتج وزيادة اقبال المستهلكين على شرائه ·

INTRODUCTION

A wide range of products are obtained from tomatoes such as juice, paste, catsup, sauce, puree, and many others. These products are used the world over for either their color or flavor.

In certain countries each of these products is identified by certain criteria as viscosity, soluble or total solids, amounts of salt added and presence of some food additives such as pepper, vinegar, etc. In the U. S. A., for example, tomato paste is defined as that product that contains not less than 25% of salt-free tomato solids (Canning Trade Almanac, 1955).

Iraq imports about 3000 tons of tomato paste each year from Bulgaria, Italy, Syria, Tunisia, Greece, Czechoslovakia and others for a sizable sum of money. Tomatoes produced locally are not sufficient for fresh consumption and amounts produced each year depend, usually, on the weather conditions and insect infestation. Kerbala

* Present address : Kerbala Canning Administration.

Canning Factory is the only firm that produces tomato paste on a commercial scale with a present capacity of about 200 tons per season with plans for future expansion. This amount is hardly enough for even half of the requirements of the Ministry of Defense alone (Kerbala Canning Factory Records).

The paste produced in Kerbala has a good flavor, but is not widely acceptable in the local market. This may be due to many reasons, the most important of which are :—

1. Lower viscosity than imported pastes, lower even than those having similar or lower soluble solids content.
2. Less coloring efficiency. This, in itself, enforces the consumer to use more paste for a higher cost to give the desired color in the cooked product.
3. Lesser attractive label on the can. Kerbala paste-can label carries the picture of a red tomato on a black background. This label is the least desirable among others available in the market. We were told by many store-owners that many a consumer refuses to buy such cans solely due to their black label and demands cans with red labels, the usual color for all imported cans of tomato pastes.

While the senior author of this paper was in charge of Kerbala Canning Factory, a study was initiated to improve the tomato paste produced at Kerbala so as to encourage the consumer to buy the local product with a pride and not suspicion. Accordingly, the following investigations were deemed necessary and in order :—

1. Tomato paste manufacturing process actually used in Kerbala and its probable improvement so as to give a similar, if not better, product than the imported ones.
2. A comparative analysis of the Kerbala and imported tomato pastes to find out some of the unlawful practices used in this industry.

MATERIALS AND METHODS

1. Analysis of commercial tomato pastes :

Samples of all available imported tomato pastes were purchased from local stores. The pastes were compared and analyzed as follows :—

(a) Color comparison using full strength paste and the diluted 1:5 with water.

(b) Taste evaluation with emphasis on the presence of cooked or undesirable flavor.

(c) Texture as determined by touching between the fingers and on the tip of the tongue. This was useful in determining smoothness and final fininsh of pastes.

(d) Viscosity or ability to flow as seen visually and also by observing the time taken for 60 ml. of paste to flow through a fun-

gum was dissolved in about 15 ml. of hot water then added to the juice.

(c) Corn starch was added to the third lot at the rate of about 0.1% starch in the final paste. The starch was added in the same way as that used for the addition of gum.

All of the above juice lots were concentrated at 50 -60°C under vacuum to give pastes of about 30—32% soluble solids.

RESULTS AND DISCUSSION

1. Analysis of tomato pastes :

Table I lists a summary of the different analyses made on all commercial tomato pastes including that of Kerbala. Individual characteristics are discussed below :-

(a) **Color, flavor and texture**: The data indicate that all of the imported samples have a darker reddish or brown color than that of Kerbala. This may be due to several factors important among them being the maturity of raw tomatoes and the length of the cooking period during processing.

Unripe tomatoes would give a lighter color. Too much cooking would produce a darker colored paste, but this may also produce undesirable cooked flavor in the final product as evidenced in samples 6 and 8.

As to the presence of artificial colors, only one sample was found to contain soluble coal-tar dyes. The texture and final finish of all samples were acceptable and no large skins were present.

(b) **Salt and ash**: There is a wide variation of salt content. Some manufacturers add salt to their pastes up to about 5% without any declaration of such addition on the label. Salt is cheap and it is of course sold in this case as tomato paste for a good profit.

(c) **Vitamin C** : The variation in vitamin C content may be due to the degree of concentration, methods of processing used, and the age of paste.

Use of heat during manufacture and aging in storage cause degradation of ascorbic acid as seen clearly in Table II. Here we see that boiling of tomatoes causes over 80% loss in vitamin C. Anyway, tomato paste is not generally used as a potential source of vitamin C.

(d) **Viscosity :** The data indicate that Kerbala paste has lower viscosity than all other samples, even lower than those having lower soluble solids. This may be mainly due to the differences in the methods of

Table I

Summary of analyses of common commercial tomato pastes

No.	Type of paste and manufacturing country	Color	Presence of artificial dyes	Flavor	Texture	Viscosity	Percent Salt	Ash	pH	Perecent acid as citric	Vitamin C mg/100g	Percent Soluble solids	Total solids	Starch	Pectic acid	Gums	Gums based on salt-free total solids
1.	Balkan (Bulgaria)	Light brown	—	good	medium soft	High	2.64	3.66	4.40	3.10	11.4	43.5	53.4	0.14	4.11	1.28	2.52*
2.	Nava (Czechoslovakia)	dark red	—	good	Very soft	High	0.45	1.44	4.21	2.44	10.7	31.5	36.0	0.14	2.52	1.66	4.66
3.	Conserve (Syria)	dark red	present in some samples	good	soft	Very high	4.21	5.62	4.00	2.56	9.2	36.6	42.7	0.12	2.61	3.58	9.55
4.	Kerbala	light red	—	Exce.	soft	Very low	0.53	2.61	4.16	2.76	14.2	30.0	33.8	0.06	1.41	0.62	1.86
5.	Pea (Greece)	Medium red	—	good	soft	High	4.92	5.90	4.26	2.72	10.7	38.7	46.5	0.06	3.06	2.08	5.00
6.	Tomatenmark (Hungaria)	dark brown	—	Cooked	soft	Very high	0.35	0.87	4.43	1.78	15.5	28.8	32.4	0.09	2.57	2.56	8.00
7.	Baralla (Italy)	light red	—	good	Slightly soft	High	0.77	2.67	4.35	1.52	8.6	19.4	21.0	0.26	1.80	1.37	6.70
8.	Concentrato dipomodoro (Italy)	light brown	—	Cooked	Slightly soft	High	0.97	1.87	4.30	1.60	15.1	19.0	21.2	0.16	2.94	1.57	7.67

* % Gums based on salt-free total solids = $\frac{(\%\text{gums})\ (100)}{(\%\text{total solids}) - (\%\text{salt})}$

processing as evidenced by the wide variation of gums and pectic acid present in different samples. These, probably, are the main compounds responsible for viscosity.

Based on salt-free total solids, Kerbala paste contains 1.86% gums while samples 7 and 8 have 6.70 and 7.67% respectively. The viscosities of latter samples are also much higher than that of Kerbala paste. Although fruits and vegetables including tomatoes are known to contain natural gums and pectins in varying amounts (Cruess, 1958), no information is available as to whether the large amounts of these substances found in the imported samples are the result of special manufacturing processes or that they have been added during manufacture.

Naturally, a process that could extract these natural polysaccharides maximally may prove useful.

2. Methods of processing :

Accordingly, experiments were planned to test the effect of methods of processing on the extractability of gums and pectins in the tomato paste. Cut tomatoes were subjected to heating temperatures of 82°C and 100°C respectively prior to the extraction of juice. An unheated sample served as control. Table II lists the analyses of pastes thus produced.

Table II

Summary of analysis of tomato pastes prepared by different manufacturing methods :

No.	Methods of treating cut tomatoes before extracting juice and concentrating it into paste	Percent			Vitamin C	Viscosity
		Gum	Starch	Pectin	Mg./100 g.	(Visual comparison)
1.	Cold process (Control)	0.75	0.64	1.88	33.7	Low, flowing easily even at 30% solids.
2.	Heated at 82°C for 15 minutes	1.14	0.54	1.88	22.8	high, hardly flowing even after dilution to 15.0% solids.
3.	Boiled for 15 minutes	1.24	0.15	1.86	5.3	Very high, not flowing, even at 15% solids.

The results indicate that the three different manufacturing processes mentioned above produce pastes having similar pectin content but different levels of gums and starch. Their viscosities are also different. Amounts of starch present are inversely proportional to heat applied; the higher the temperature used the lower is the starch content. This may be due to the degradation of starch granules during heating. On the other hand heating of tomatoes during manufacturing causes an increase in gums of the final pastes prepared. Thus sample No. 3 which was prepared after boiling the tomatoes has about 1.24% gums while that prepared from the same tomatoes by the cold process contains only 0.75%. This suggests a greater extraction of gums due to heat.

The data further indicate that pastes having higher contents of gums show higher viscosities. Thus sample No. 3 even after dilution to 15% soluble solids has a much higher viscosity than the other two.

3. Addition of starch and gum :

To prove the importance of starch and gums and their effects on viscosity, corn starch and a high grade acacia gum powder were added to regular tomato juice just before concentration into pastes. The results obtained are presented in Table III.

Table III

Addition of starch and acacia gum and their effects on the properties of tomato pastes

No.	Compound added and	%	Soluble solids %	Viscosity	
				Visual comparison	Time (seconds) of flow in funnel to collect 60 ml.
1.	Control	0	30	Low (runny)	6.3
2.	Acacia mum	1.5	30	Very high	8.3*
3.	Corn starch	0.5	30	Low (hurry)	6.3

* This number, 8.3 seconds, is the time of flow obtained after diluting the paste with water to 10.5% solids. The original paste, having 30% solids, has a very high viscosity that it does not run through the funnel without dilution.

The data indicate that there is no change in viscosity due to addition of starch, but the gum increases the viscosity to such a high degree that even after dilution to 15% soluble solids the paste is still viscous and hard to flow.

A natural source of gum, of course, is preferable to adding gums artificially. Tomatoes must be cooked as a whole, seeds and skins together, before straining the juice and proceeding to concentration. Kerbala Canning Factory must follow this advice to produce a more viscous and desirable tomato paste.

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EFFECT OF LEVEL OF NITROGEN FERTILIZER AND DATE OF APPLICATION ON YIELD OF LETTUCE[1]

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SUMMARY

A study was conducted to determine effects of rate and date of N fertilizer application on yield and nitrogen content of lettuce at Abu-Ghraib Experiment Station in 1964—1965.

Statistical analysis of results showed significant effect of rate of N fertilizer on yield, weight per head, N content of leaves and total N uptake at harvest time. It appeared that 100 kg. of ammonium sulfate per donum was optimum under conditions of this experiment. It made little difference to add fertilizer before or after planting if ammonium sulfate was used.

الخلاصـــة

اجرى البحث لدراسة تأثيركمية وموعد استعمال السماد النتروجيني على صنف الحاصل ومحتوى النتروجين للخس في مزرعة ابي غريب في ١٩٦٤ ـ ١٩٦٥ . دل التحليل الاحصائي للنتائج على وجود تأثير مهم لكمية السماد النتروجيني على الحاصل ، على وزن الرأس الواحـد ، على محتوى النتروجين في الاوراق وعلى مجموع النتروجين الممتص من قبل النباتات الى وقت الحصاد . تبين أن ١٠٠كغم من سلفات الامونيوم بالدونم كانت مثالية تحت ظروف هذه التجربة . لم يكن هناك فرق كبير في اضافة السماد قبل أو بعد الزراعة في حالة استعمال سلفات الامونيوم .

INTRODUCTION

Commercial fertilizers and manures were used to increase crop yields. Leafy-type vegetables are known to require more nitrogen fertilizers than other crops (4). Lettuce is one of the important vegetable crops in Iraq. Farmers have been using organic matter as N fertilizer. Since inorganic nitrogen is becoming more available for use in modern farming, a knowledge of the proper use of these fertilizers is needed under Iraqi conditions. The purpose of this work was to determine the effect of different levels of ammonium sulfate and time of application on the yield of lettuce.

MATERIALS AND METHODS

This experiment was carried out at the Agricultural Experiment Station at Abu-Ghraib Farm as a (3x4) factorial experiment in a randomized complete block design to study the effect of four rates of nitrogen and three times of application. The 12 treatment combinations were replicated 6 times.

(1) This work was done at the Arid Zone Research Institute, University of Baghdad.

Proper soil cultivation was done and the land was divided into (5x5.5m) plots. Four rows were planted in each plot in a manner similar to that used by local farmers. Seedlings of a variety of lettuce were transplanted on October 19, 1964.

Rates of fertilizer were: control, 50, 100, and 150 kg. of ammonium sulfate per donum. Times of application were: all amount of fertilizer on October 12, 1964 (one week before planting), one half of the amount of fertilizer added on November 11, 1964 (three weeks after planting) with the other half of the fertilizer added on January 31, 1965 (14 weeks after planting), and all amount of fertilizer added on November 11, 1964 (three weeks after planting).

Leaf sampling was done on 28/11/1964, 30/1/1965, and 10/3/1965 (at harvest time), by taking a number of leaves from each plot at random. A composite sample from the 6 plots of each treatment was prepared for total N analysis by the Kjeldahl method. Soil samples from each plot were taken for electrical conductivity (EC) determination using a conductivity bridge.

Total nitrogen uptake was calculated for the total dry matter assuming a moisture content of 94.8% (2).

All data were analyzed statistically by the methods outlined by Li (5).

RESULTS AND DISCUSSION

Analysis of variance of EC values showed no significant statistical difference (5% level of probability) among means of EC for treatment. Means of EC for all blocks except block 3 were uniform. Block 3 had a higher EC mean. However, the overall mean of EC was 3.67 which is not generally considered limiting for plant growth.

Since number of heads per plot varied, an analysis of covariance for yield and number of heads was conducted. Table 1 shows mean yields in kg. per plot adjusted for a uniform number of heads per plot equal to 117 which was the overall mean for number of heads per plot. Different levels of nitrogen fertilizer caused highly significant (1% level of probability) differences in yield of lettuce. Fig. 1 shows the relationship between adjusted yield and amount of fertilizer.

Table 1. Adjusted Means of Yield in kg./plot for Treatments : (adjusted for a uniform number of heads/plot 117).

Date of fertilizer application	kg./donum* fertilizer				Mean
	0	50	100	150	
12/10	29.52	35.61	40.46	37.91	35.88
25/11 and 31/1	28.06	35.31	40.69	45.10	37.29
25/11	24.84	36.30	46.75	41.01	37.23
Mean	27.47	35.74	42.63	41.34	36.80

* Donum = 2500 M^2

Figure 1.

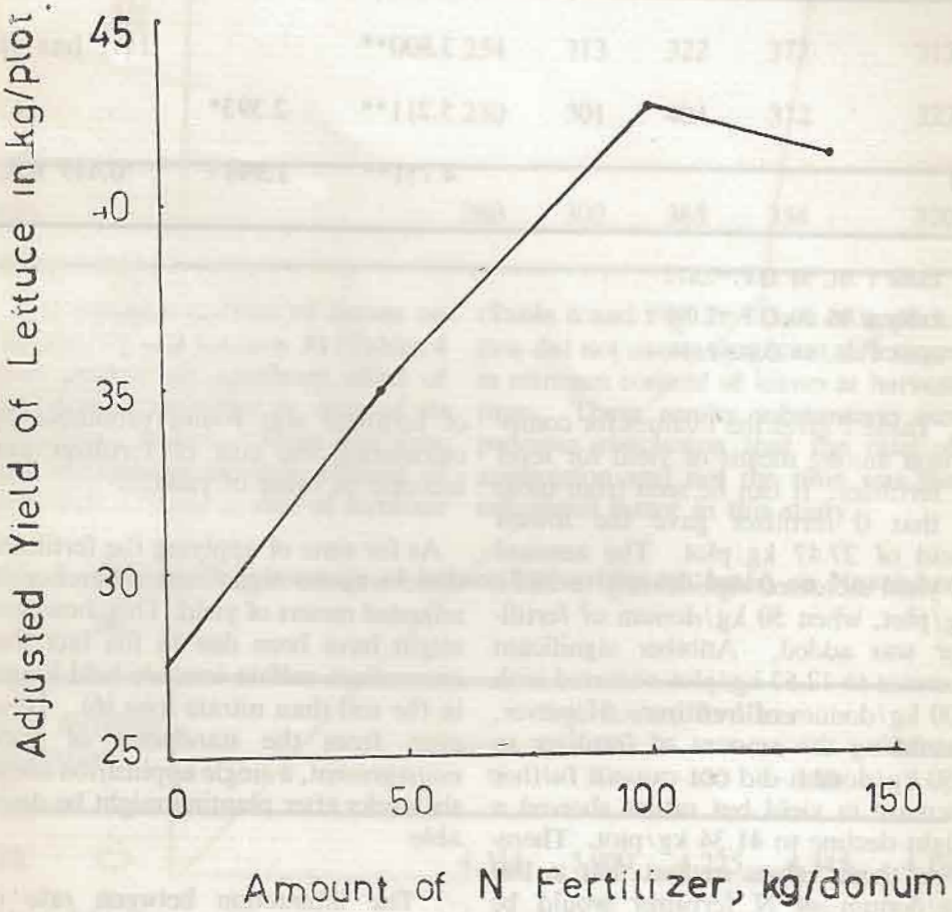
Adjusted Yield of Lettuce in kg/plot
45
40
35
30
25
0
50
100
150
Amount of N Fertilizer, kg/donum

Table 2. t-values for comparison among adjusted yield means for amount of fertilizer.

kg./donum	0	50	100
50	3.800**		
100	5.211**	2.393*	
150	4.751**	1.948+	0.449 n.s.

** Table t .01, 54 D.F.=2.672
* Table t .05, 54 D.F.=2.006
+ Table t .10, 54 D.F.=1.676

Table 2 gives the t-values for comparison among means of yield for level of fertilizer. It can be seen from table 1 that 0 fertilizer gave the lowest yield of 27.47 kg/plot. The amount of yield increased significantly to 35.74 kg/plot, when 50 kg/donum of fertilizer was added. Another significant increase to 42.63 kg/plot occurred with 100 kg/donum of fertilizer. However, increasing the amount of fertilizer to 150 kg/donum did not cause a further increase in yield but rather showed a slight decline to 41.34 kg/plot. Therefore, these values suggest that a 100 kg/donum of N fertilizer would be optimum under these conditions.

The leveling off in yield with further increase in fertilizer is in agreement with the results obtained by other workers (1,3,7).

Using 50 and 100 kg. per donum of fertilizer was found profitable by calculating the cost of fertilizer and increase in value of yield.

As for time of applying the fertilizer, there was no significant difference in adjusted means of yield. This, however, might have been due to the fact that ammonium sulfate ions are held longer in the soil than nitrate ions (6). However, from the standpoint of good management, a single application about six weeks after planting might be desirable.

The interaction between rate of fertilizer and date of application was not significant in adjusted yield.

Similar results to these were obtained when an analysis of variance was conducted on the weight (in grams) per head (Table 3).

Table 3. Means of weight per head (in grams) for treatments

Date of fertilizer application	kg./donum fertilizer				Mean
	0	50	100	150	
12/10	297	292	370	318	319
25/11 and 31/1	254	313	322	372	315
25/11	230	301	404	372	327
Mean	260	302	365	354	320

The nitrogen content of leaves on November 28 and January 30 (Tables 4 and 5) showed no significant effect of either rate of fertilizer or date of its application. However, there was significant increase in nitrogen content of leaves with increase in rate of fertilizer (Table 6 and Fig. 2). Date of application did not cause significant difference in nitrogen content of leaves at harvest time. These results substantiate our previous conclusion that the rate of application and not the time was the influential factor in this study.

Table 4. Average N percentage of lettuce leaves (dry wt. basis) on November 28.

Date of fertilizer application	kg./donum fertilizer				Mean
	0	50	100	150	
12/10	4.313	3.900	4.225	4.345	4.196
25/11 and 31/1	4.020	4.145	4.430	4.550	4.286
25/11	4.265	4.185	4.835	4.220	4.376
Mean	4.199	4.077	4.497	4.372	4.286

Figure 2.

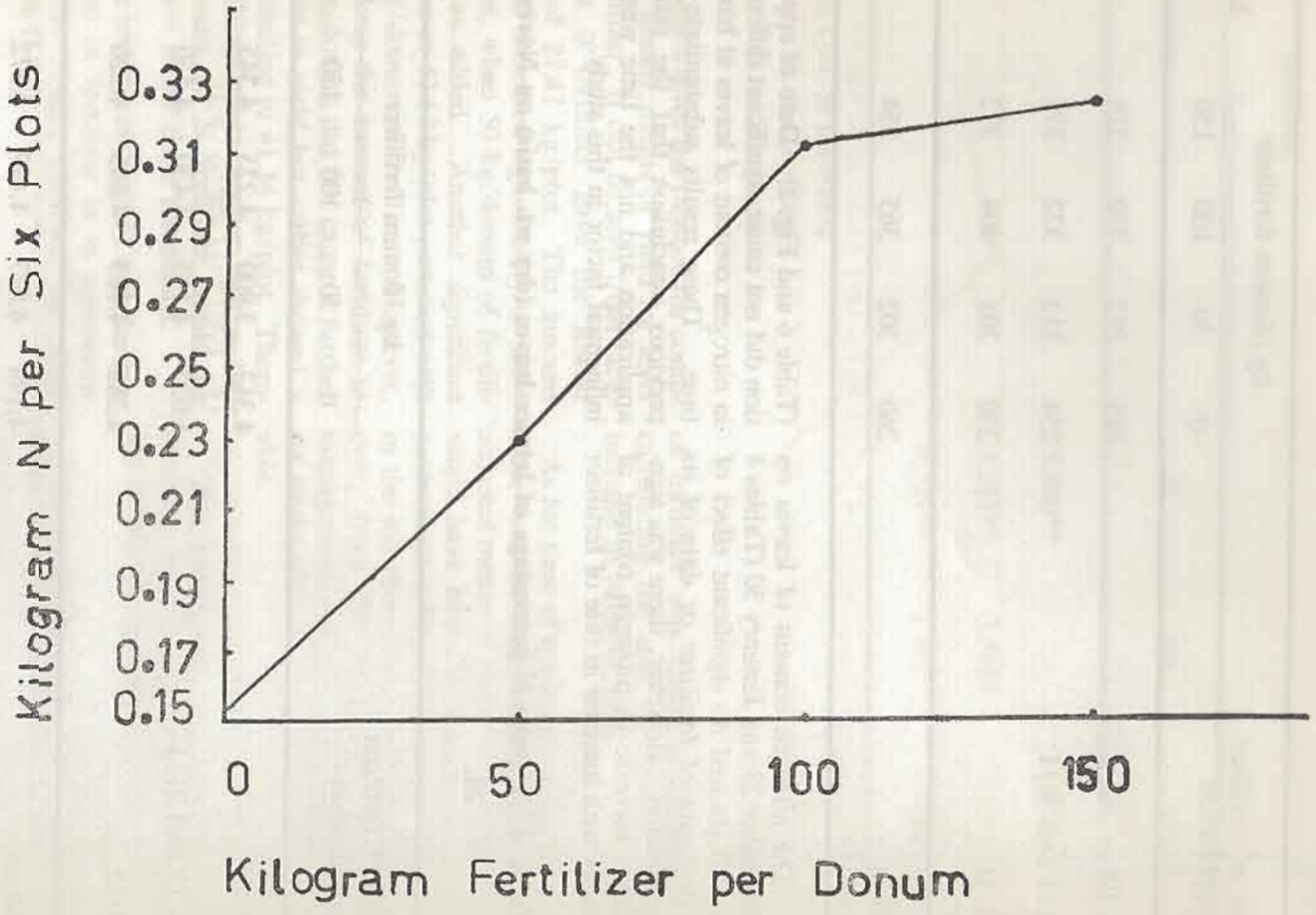
Kilogram N per Six Plots
0.33
0.31
0.29
0.27
0.25
0.23
0.21
0.19
0.17
0.15
0
50
100
150
Kilogram Fertilizer per Donum

Table 5. Average N percentage of lettuce leaves (dry wt. basis) on Jan. 30.

Date of fertilizer application	kg./donum fertilizer				Mean
	0	50	100	150	
12/10					
25/11 and 31/1	3.135	2.735	3.196	3.105	3.043
25/11	3.118	3.028	3.120	3.285	3.138
Mean	3.015	2.963	3.139	3.203	3.080

Table 6. Average N percentage of lettuce leaves (dry wt. basis) at harvest time.

Date of fertilizer application	kg./donum fertilizer				Mean
	0	50	100	150	
12/10	1.996	1.999	2.310	2.470	2.194
25/11 and 31/1	1.840	2.093	2.277	2.545	2.189
25/11	1.756	1.973	2.390	2.433	2.138
Mean	1.864	2.022	2.326	2.483	2.174

Table 7. Total N uptake of lettuce in kg./6 plots at harvest time.

Date of fertilizer application	kg./donum fertilizer				Mean
	0	50	100	150	
12/10	0.167	0.229	0.282	0.291	0.242
25/11 and 31/1	0.162	0.232	0.298	0.375	0.267
25/11	0.135	0.229	0.352	0.303	0.255
Mean	0.155	0.230	0.311	0.323	0.255

Figure 3.

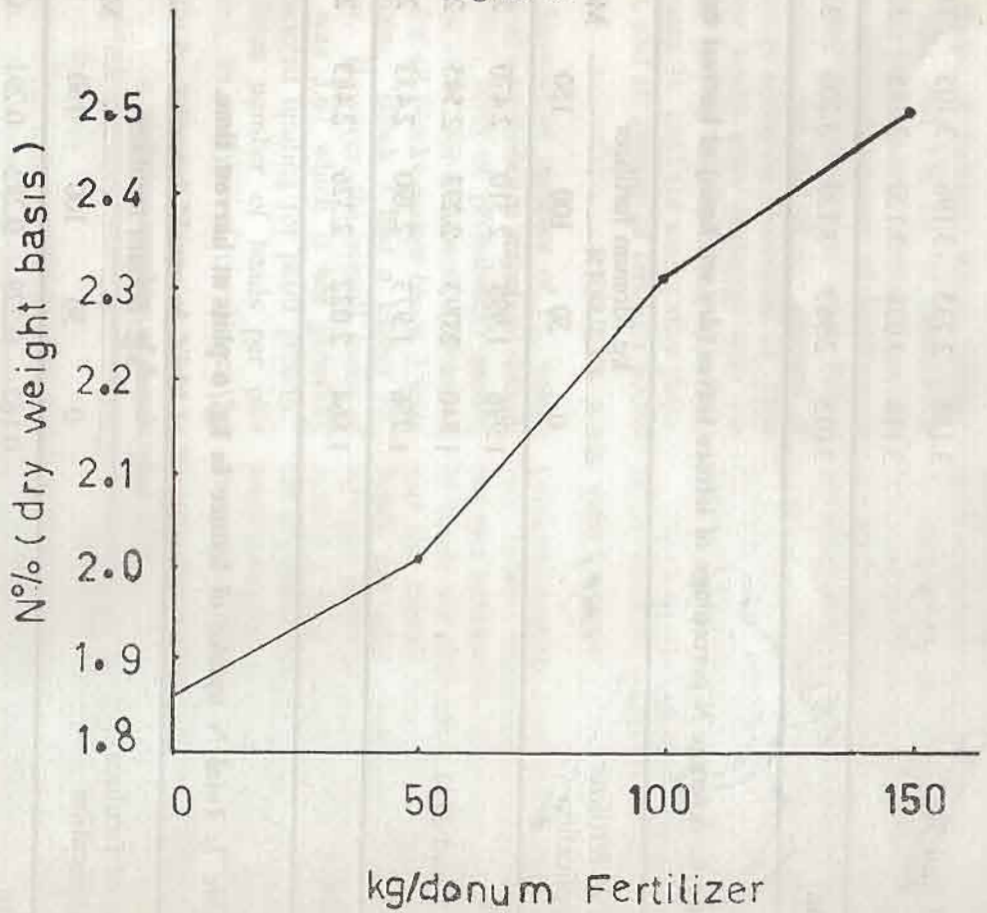
N% (dry weight basis)
2.5
2.4
2.3
2.2
2.1
2.0
1.9
1.8
0
50
100
150
kg/donum Fertilizer

Table 7 and Fig. 3 show total nitrogen uptake at harvest time. In this case also, significant differences were found due to rate of fertilizer. With zero N the total N content of lettuce from six plots was 0.155 kg. By adding 50kg. per donum of ammonium sulfate, the total N uptake was 0.230kg. per six plots. Another significant increase to 0.311 kg. occurred when 100 kg. of fertilizer was added. Again, no further increase occurred with the highest amount of fertilizer used in this experiment.

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EGG QUALITY OF SOME STANDARD BREEDS IN IRAQ

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SUMMARY

This research was carried out at the College of Agriculture, Abu Ghraib, Iraq. Eggs laid by White Plymouth Rocks, Rhode Island Reds, New Hampshires and Single Comb White Leghorns were used in this experiment. Results obtained may be summarized as follows :—

1. New Hampshire eggs were the heaviest, while eggs of Rhode Island Reds were the lightest. Significant differences existed among breeds.
2. Yolks varied in weight among breeds. White Rocks were larger, while R. I. Reds were smaller. When yolks were calculated as percentage to entire egg weight, Single Comb White Leghorn eggs comprised the highest percentage. Significant differences were found among breeds.
3. The same trend was approached with respect to the albumen of the eggs.
4. Shells varied in weight, but there were no significant differences between breeds.
5. Shell thickness varied according to breeds. Eggs of New Hampshire were the thickest, while eggs of Single Comb White Leghorn were the thinnest.
6. Figures of Haugh Units indicate that White Rocks are of superior interior quality followed by R.I.R., N. Hampshire, and Leghorn.

الخلاصـــة

اجرى هـذا البحث فى حقـل الدواجن بكلية الزاعـة ـ ابو غريب لغرض دراسة جـودة صفات البيض الناتج من أنواع رود ايلاند الاحمر واللكهورن الابيض والنيوهامشير والبليموث روك الابيض وقد كانت نتائج البحث كما يلى :ـ

١ ـ كان بيض دجاج النيوهامشير أثقلها وزنا بينما كان بيض الرود ايلاند اخفهـا وزنا ووجـدت فروق احصائية معنوية بين الانواع ٠

٢ ـ اختلفت أوزان الصفار بالنسبة للانواع المدروسة ووجدت فروق معنوية بين الانواع وحينمـا حسبت النسبة المئوية للصفار بالنسبة لوزن البيض الكلى كانت نسبة الصفار فى بيض اللكهورن أعـــلاها ٠

٣ ـ حصلنا على نفس النتيجة السابقة بالنسبة للبياض ٠

٤ ـ اختلفت أوزان القشرة بالنسبة للانواع ولكن لم تزجد بينها فروق معنوية ٠

٥ ـ كان بيض النيوهامشير ذا قشرة سميكة عند مقارنته مع الانواع الاخرى بينما كان بيض اللكهورن أقلها سمكا ٠

٦ ـ قدرت وحدات (هوه) من حيث صفات البيض الداخلية ووجد ان بيض البليموث الابيض أعلى الانواع من حيث جودته الداخلية بينما بيض اللكهورن كان أقلها من حيث هذه الصفة ٠

INTRODUCTION

Recently, increasing attention has been directed toward interior egg quality. The aim is more nearly uniform quality that is pleasing to both

poultry man and the consumer. This research was carried out to make a comparative study among standard breeds of chicken under Iraqi condition with respect to egg quality.

A. Egg Components :

There are considerable variations in the percentages of egg components among strains and among the individuals within each strain (Dawson, Shampion, Davidson and Zindel, 1954.) Contrary to that, Taylor and Martin (1928) stated that among chickens, there are no detectable breed differences in the degree of variability with respect to the weight of the major components of eggs.

Hafez and Kamar (1956), El-Ayadi (1956), El-Warraki (1957), Amer (1959) and El-Ibiary (1963) stated that native eggs exhibited a higher percentage of yolks compared to those of foreign breeds. When the comparison was made among foreign breeds, Maszaro (1934) found that the ratio of yolk weight to total egg smaller in Rhode Island Red compared to that in other breeds studied.

B. Egg Quality :

Top grade eggs are those which seem to be most attractive in appearance to the consumer, produce best results in cookery, contain maximum nutritional values and satisfy the consumer. Erasmus (1954) reported that there are differences among inbred lines with regard to shell thickness. Baelum (1954) stated that the thick albumen was superior in height in New Hampshire and Rhode Island Red than in Leghorn ones.

King and Hall (1955) agreed with the previous result showing the superiority of New Hampshire birds in albumen quality than other breeds studied. Haugh Units, yolk index and thick albumen diameter were believed to be the most practical interior quality measurements for the evaluation of eggs (Wisley and Stadelman, 1959.) Hall and Helbacka (1959) found that the H.U. of Rhode Island Red eggs was 79.0, while Muller (1959) found it to be 82.0. Eisen and Bahren (1963) found that albumen height was 5.2 mm. and that the H.U. was 68.89. With regard to yolk index of Egyptian market eggs, El-Ibiary (1963) stated that it was 0.52 during January and 0.39 during June with an over-all average of 0.44 for the entire year. He added that yolk index larger in fresh eggs than in those which were not fresh.

MATERIALS AND METHODS

One hundred and twenty five eggs (five eggs daily during winter) from each of the four foreign breeds studied, namely New Hampshire, Rhode Island Red, White Plymouth Rock and Single Comb White Leghorn were used in this study. Eggs were chosen at randon from those laid by the flock belonging to the Poultry Farm, Faculty of Agriculture at Abu Ghraib, Baghdad University. The Points studied and method of measuring were summarized in the following table :—

Characteristics studied	Method of Measurements
1. Egg Components	1—The method used by Salch (1948) and Amer (1959).
2. Thick albumen height	2—Tripod mounted Ames micrometer. Fig. I, but modified.
3. Yolk index	3—It is the ratio of the height of the yolk which was measured by the previous, apparatus and the diameter which was measured by means of a calipar.
4. Haugh Units (H. U.)	4—It is measured by using the interior. egg quality calculator (Fig. 2).
5. Shell thickness	5—After shells were washed, dried in an oven at 1050 C. for 24 hours, an Ames watch-like micrometer was used for measuring shell thickness. (Fig. 3).

Statistical analysis were carried out according to Snedecor (1946).

RESULTS AND DISCUSSION

1. Egg Weight: Table I presents mean egg weight in grams and that of the components of eggs according to breeds. It could be easily observed that New Hampshire eggs are heavier followed by W. Rocks, S.C. W. Leghorns and Rhode Island Reds as the mean weights in grams were: 60.82, 57.69, 55.20, and 54.20 grams for the breeds, respectively.

Table I. Weight of Egges and their components in grams for various breeds studied.

Breeds	Egg Weight	Shell		Yolk		Albumen	
	Gm.	Gm.	%	Gm.	%	Gm.	%
New Hampshire	60.82	5.13	8.46	16.93	27.83	38.76	63.71
Rhode I. Red	54.20	4.64	8.56	14.80	27.36	34.76	64.08
White Rock	57.69	5.05	8.75	17.66	30.61	34.98	60.64
S.C.W. Leghorn	55.20	5.02	9.09	17.50	31.70	32.48	59.21

Each two breeds compared and tests of significance were calculated and shown in Table 2.

Table 2. Test of Significance Between Each two Breeds.

Breeds Compared	Test of significance	Egg	Shell	Yolk	Albumen
New Hampshire and Rhode Island Red.	L.S.D.	2.48	0.44	1.11	2.27
	Difference	6.62++	0.42	2.13	4.00+
New Hampshire and White Plymouth Rock.	L.S.D.	2.48	0.44	1.11	2.27
	Difference	3.13+	0.08	0.73	3.78+
New Hampshire and S. C. W. Leghorn.	L.S.D.	2.48	0.44	1.11	2.27
	Difference	5.62+	0.11	0.63	6.28++
Rhode Island Red and White Plymouth Rock.	L.S.D.	2.48	0.44	1.11	2.27
	Difference	3.49+	0.41	2.86+	0.22
Rhode Island Red and S. C. W. Leghorn.	L.S.D.	2.48	0.44	1.11	2.27
	Difference	1.00	0.38	2.70+	2.28+
White Plymouth Rock and S.C.W. Leghorn	L.S.D.	2.48	0.44	1.11	2.27
	Difference	2.49+	0.03	0.16	2.50+

**Highly significant at 0.01 level.

* Significant at 0.05 level.

Highly significant differences were found between egg weight of New Hampshires and Rhode Island Reds on one hand or S. C. White Leghorns on the other. Significant difference was also found between White Rock and either R.I. Red or New Hampshire ones or Leghorns. Contrary to that, there were no significant differences between R.I. Red eggs and S. C. W. Leghorn ones with respect to egg weight. These results hold true with those found by Moustageer (1958) and Amer (1959) who stated that breeds differed significantly in their egg weight.

2. Egg Components :

A. **Yolk**

Weight : Average weight in grams for yolk of the different breeds is shown in Table I. These weights ranged between 14.80 and 17.66 grams. White Rock eggs possess the larger yolks of 17.66 grams, while Rhode Island Red ones have the smallest yolks. New Hampshire eggs and Leghorn eggs came in between. When yolks were calculated as percentage to total egg weights, S.C.W. Leghorn eggs comprised the highest percentage of

yolk (31.70%) followed by those of White Rocks (30.61%), New Hampshires (27.83%) and Rhode Island Reds (27.36%). However, Table 2 indicates that significant differences were found only between Rhode Island Red yolks and New Hampshire yolks on one hand and Leghorn ones on the other. The same significant difference was found between Rhode Island Red and White Rock.

Yolk index : The yolk index was calculated as the ratio of yolk height and yolk diameter. Heights and diameters of yolks for the breeds are shown in Table 3.

Table 3. Estimates of egg quality in the breeds studied.

Breeds.	Albumen height mm.	H. U.	Yolk Height in cm.	Yolk Diam. cm.	Yolk Index	Shell thick. Inch
New Hampshire	9.7	99.8	2.04	4.16	0.490	0.148
Rhode Island Red	10.3	100.8	1.70	4.12	0.412	0.140
White P. Rock	10.8	102.1	2.08	4.17	0.498	0.143
S.C.W. Leghorn	9.1	95.5	1.95	4.13	0.472	0.131

Height and diameter of yolk showed the same trend in a given breed. They were the largest in White Rocks and the smallest in the Rhode Island Reds while those of Leghorn and New Hampshires were in between. Yolk indices were calculated and was easily observed that White Rocks gave the highest of 0.498, followed by New Hampshires (0.490), Leghorns (0.472) and Rhode Island Red (0.412). This means that White Rock eggs are the best, while the Rhode Island Reds are lower in quality in this respect. However, Table 4 shows that there is no significant difference between New Hampshire and White Rock eggs or between the New Hampshire and Leghorn eggs with regard to yolk index.

Table 4. Test of significance between each two breeds for data presented in Table 3.

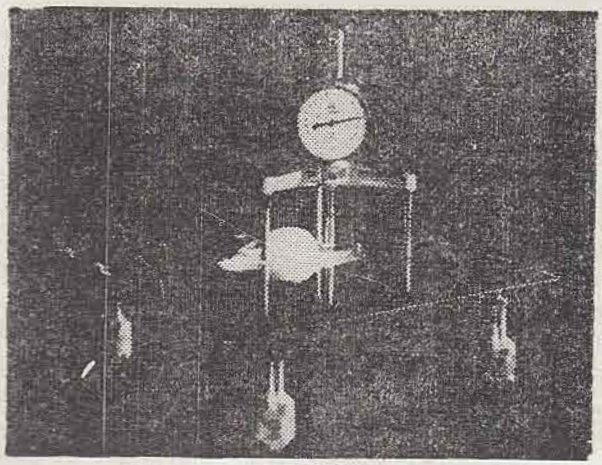
Breeds	Test of significance	Characteristics Studied			
		Albumen height	Haugh Units	Yolk index	Shell thickness
New Hampshire and Rhode Island Red.	L.S.D.	0.7	1.3	0.002	0.008
	Difference	0.6	1.0	0.078++	0.008
New Hampshire and White Plymouth Rock.	L.S.D.	0.7	1.3	0.022	0.008
	Difference	1.1+	2.3+	0.008	0.005
New Hampshire and S. C. W. Leghorn.	L.S.D.	0.7	1.3	0.022	0.008
	Difference	0.6	4.3+	0.018	0.017++
Rhode Island Red and White Rock.	L.S.D.	0.7	1.3	0.022	0.008
	Difference	0.5	1.3	1.086++	0.003
Rhode Island Red and Leghorn	L.S.D.	0.7	1.3	0.022	0.008
	Difference	1.2+	5.3++	0.060++	0.009+
White P. Rock and S. C. W. Leghorn.	L.S.D.	0.7	1.3	0.022	0.008
	Difference	1.7+	6.6++	0.026+	0.012+

**Highly significant at 0.01 level.
* Significant at 0.05 level.

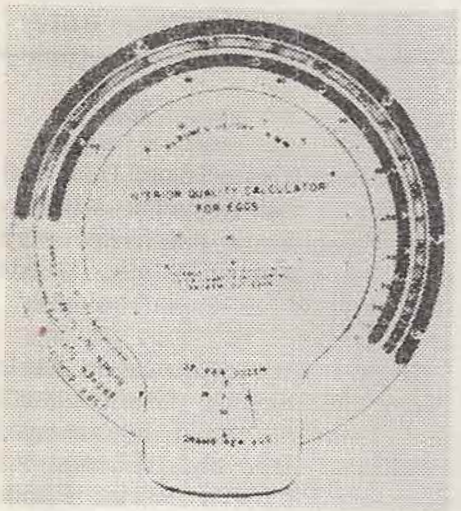
B. **Albumen :**

Weight : The great amount of albumen was found in New Hampshire eggs (38.76 grams) while the least amount was found in S. C. W. Leghorn (32.48 grams) as shown in Table I. When this absolute amount was calculated as percentage of the whole egg, Rhode Island Red eggs had the highest estimate of 64.08% followed by New Hampshires (63.71%), White Rocks (60.64%), and the Leghorn eggs (59.21%). However, tests of significance showed that there were no significant difference between Rhode Island Reds and White Rocks with respect to albumen weight. Significant differences were noticed between any two other breeds in this respect.

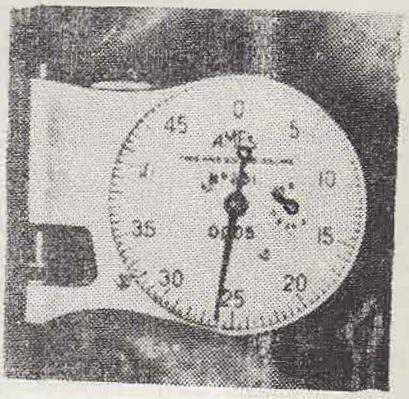
Height : Data presented in Table 3 show the albumen height for all eggs. Estimates could be arranged as follows: 10.8, 10.3, 9.7, and 9.1 millimeters for White Rocks, Rhode Island Reds, New Hampshires and S.C. W. Leghorns, respectively. White Rocks showed superiority in this respect. When this data were statistically analyzed, as shown in Table 4, it



Triped mounted Ames micrometer.



Interior egg quality Calculator



was found that there were no significant differences between New Hampshire eggs and R. I. Reds, between New Hampshire eggs and Leghorn or between Rhode Island Reds and White Rocks. On the other hand, significant difference was existed between each other two comparisons.

Haugh Units: Evaluation of eggs by means of Haugh Units is considered among the valuable methods for determining egg quality. Estimates of Haugh Units are presented in Table 3. White Plymouth Rock eggs possessed the highest value indicating their superiority over eggs of the other breeds in this study. Average Haugh Units were: 102.1, 100.8, 99.8, and 95.5 for White Plymouth Rock, Rhode Island Red, New Hampshire and S.C.W. Leghorn eggs, respectively. Tests of significance between each two breeds were calculated and shown in Table 4. Highly significant difference was found between S.C.W. Leghorn eggs on one hand and Rhode Island Red or White Rock on the other. Significant difference was found also between New Hampshire and both White Rock and S.C.W. Leghorn.

C. Shell

Weight: Average shell weight ranged between 4.64 gms. and 5.13 grams and that New Hampshire eggs possessed the heavier shells of 5.13 grams followed by White Rocks, (5.05 gms.), Leghorns (5.02 gms.) and R. I. Red eggs (4.64 gms). Percentage of shell weight compared to the entire egg weight is shown in Table 1. Average percentages ranged between 8.46% and 9.09%. However, Table 4 indicates that there were no significant differences between each two breeds in respect to shell weight. These results are in harmony with those found by Moustageer (1959).

Thickness: Another characteristic with regard to shell was studied. This characteristic is shell thickness which was estimated and presented in Table 3. Average shell thickness ranged between 0.131 and 0.148 inches. S.C. White Leghorn eggs have the thinnest shells (0.131). This may cause the breakage of eggs during transportation. New Hampshire eggs have the thickest shells (0.148 inches). However, Table 4 showed that there were no significant differences in shell thickness between New Hampshire and R.I. Red or between New Hampshire and W. Rocks and between Rhode Island Red and Single Comb White Leghorn. Highly Significant differences were found between New Hampshire and S. C. White Leghorn shells. Only significant difference was found between White Rock and Leghorn shells.

CONCLUSION

Characteristics studied in this experiment are the most practical production for interior egg quality. They may encourage other investigators to study the relationship between egg quality and marketing channels to reduce loss in internal egg quality.

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DEMAND AND PRICE ANALYSIS OF MEAT IN IRAQ

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SUMMARY

The principal objectives of this study were to review and analyze supply, consumption and price trends of a selected group of meats during 1953—64, and to project prices to 1975.

The results of the analysis showed that the consumption of meat has increased at a rate faster than the rate of increase in its supply. It may have been partly for this reason that mutton and beef prices have increased at relatively rapid rates (7.5% and 10% respectively per year) during 1953—61. Mutton and beef prices are expected to be 440 and 360 fils, respectively in 1975.

A policy of importing certain quantities of meat while domestic production is expanded was suggested to prevent a further hike in meat prices in Iraq.

خلاصـــــة

ان مراجعة وتحليل اتجاهات استهلاك وعرض واسعار مجموعة معينة من اللحوم خلال ١٩٥٣ ـ ١٩٦٤ واستنتاج الاسعار المتوقعة فى سنة ١٩٧٥ كل ذلك هو من الاهداف الرئيسة لهذه الدراسة ٠

وجد بأن استهلاك اللحوم ارتفع بنسبة أعلى من ارتفاع عرضه خلال السنوات المبينة اعلاه ٠ وكما ان اسعار لحوم الاغنام والابقار قد ارتفعت بمعدلات سنوية قدرها ٧ر٥٪ و ١٠٪ على التوالى ٠ ومن المتوقع أن ترتفع اسعار لحوم الاغنام والابقار الى حوالى ٤٤٠ و ٣٦٠ فلسا على التوالى فى سنة ١٩٧٥ ٠

ان سياسة استيراد كميات معينـة من اللحوم والعمل على زيادة الانتاج المحلى هما من البرامج المقترحـة للتخفيف من سرعة ارتفاع اسعار اللحوم فى العراق ٠

INTRODUCTION

The livestock industry contributes a high percentage of Iraq's national income from agriculture. During 1961, the livestock industry contributed about 47% of the national income from agriculture (4). During 1953—61, the economic importance of the livestock industry has increased, relative to the agricultural sector of the economy as a whole. Although the income from livestock increased at a rate of about 4% per year, the income received from agriculture as a whole increased at a yearly rate of about 1% (4).

In spite of the rapid rate of increase in the economic importance of the livestock industry, little attention has been directed towards improving the quality and the productivity of Iraqi livestock (4). This situation is expected to have an adverse effect on the availability of livestock products on the market. If this shortage of livestock products is accompanied by an increase in demand, the price increase will tend to accelerate. For this reason, an economic study of the livestock industry will be of great value to the economy of Iraq. The results of such study may assist individual producers and national agricultural planners to formulate long-range production policies that will meet future increases in demand.

Since the study of the livestock

economy has several aspects and the authors have only a limited amount of time, this report will be concerned only with the analysis of meat industry in Iraq. Specifically, the principal objectives of this report are to :

1. Review the historical trends of supply, consumption and prices of a selected group of meats (mutton, goat, beef, buffalo, and camel) during 1953—54, and
2. To project meat prices to 1975 in the light of the projected values of the factors (meat supply, population, national income and time) which were considered to influence meat prices in Iraq.

MATERIALS AND PRODCEDURE

The data which was utilized for this study covered the years 1953—64. Simple statistical and multiple correlation and regression techniques were used in the analysis of the data.

RESULTS

The results of the analysis showed that the per capita supply of all meat has increased the most during 1953–57 (Figure 1). It reached its peak in 1960 and declined slightly during 1960—64. The per capita consumption of all meat has followed the same pattern of change as that of the per capita supply (Fig. 1). However, the supply of meat has lagged behind its consumption.(*) While the per capita supply of all meat increased at a yearly rate of about 3%, the per capita consumption increased at a rate of about 5% a year, during the years indicated above. Thus, it appears that the supply of all red meat has lagged behind its consumption at a yearly rate of about 2%. That's why the gap between supply and consumption has narrowed during the past years until they overlapped in 1959 and later years. In spite of the fact that mutton contributed, on the average, more than 50% of all meat supplied, its per capita supply has lagged the most behind its consumption. The per capita supply of mutton has increased at a yearly rate of less than 2%, while its per capita consumption has increased at a rate of about 5% (Tables 1 & 2). These changes in the per capita supply and consumption appear to have been accompanied by a rapid increase in the per capita real income of the Iraqi consumers. During 1953—64 the per capita real income increased at about 6.5% per year (Table 3). Furthermore, the population of Iraq has increased at

(*) Iraq was a regular net exporter of livestock until 1959. However there was no export during the years which followed 1959. During 1959—64, livestock production has been directed to satisfy the domestic demand for meat and to expand livestock inventories, especially sheep, cattle and water buffalo. Nevertheless, goat and camel inventories appear to have been declined during the past years. (See D.G. Animal Resources and Veternary Services, Annual Reports for the years 1953—64, Baghdad, Iraq).

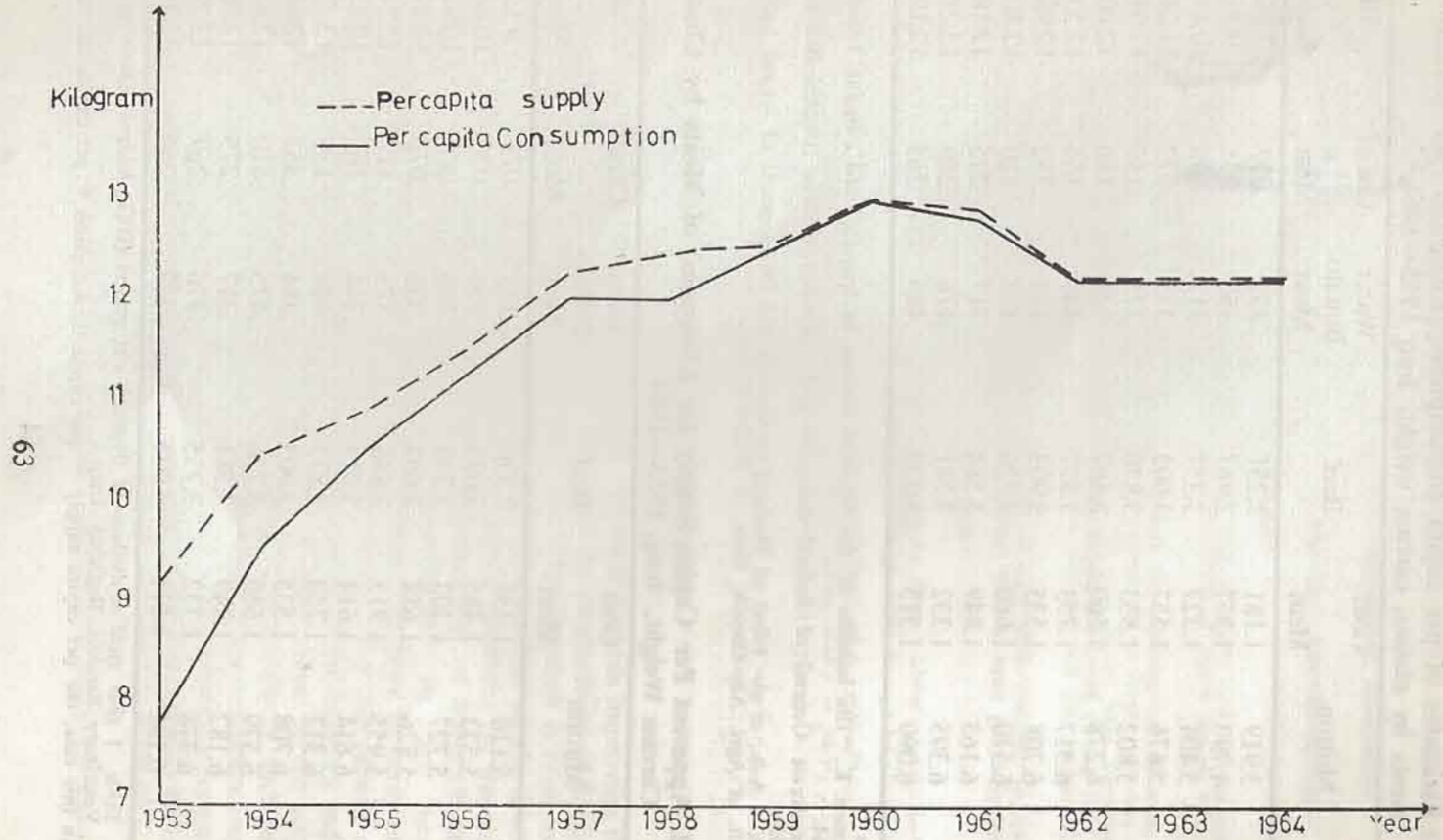


Fig.1 Per capita supply and consumption (in kilograms) of all meat, Iraq, 1953-64.

Table 1. Estimates of per capita consumptions (Kilograms per person) of meats by classes, carcass weight, Iraq 1953—1964.*

Year	Mutton	Goat Meat	Beef	Water Buffalo Meat	Camel Meat	All Meat
1953	3.919	1.181	2.251	.333	.077	7.761
1954	4.793	1.357	2.967	.350	.075	9.542
1955	5.404	1.327	3.357	.317	.073	10.478
1956	5.676	1.557	3.603	.335	.072	11.245
1957	5.802	1.853	3.870	.375	.117	12.017
1958	6.278	1.560	3.667	.344	.160	12.009
1959	6.317	1.753	3.877	.449	.155	12.531
1960	6.708	1.535	3.903	.484	.352	12.982
1961	6.510	1.680	3.726	.475	.410	12.801
1962	6.163	1.849	3.584	.317	.275	12.188
1963	6.395	1.332	3.741	.476	.269	12.213
1964	6.090	1.313	4.035	.489	.265	12.194

* Source :
1. Hasseb, K. "The estimate of the National Income in Iraq 1953—61", Beirut, Lebanon, 1964.
2. Directorate General of Animal Resources and Veterinary services (Unpublished data, 1965).
3. Asker, A.A., et al. "Effect of Docking on Growth and Development of Awassi Lambs" Coll. of Agri. Abu-Ghraib, Univ. of Baghdad, Iraq.

Table 2. Apparent Per Capita Supply (in Kilograms) of Meats by Classes, Carcass Weight, Iraq, 1953—1964.

Year	Mutton	Goat Meat	Beef	Water Buffalo Meat	Camel Meat	All Meat
1953	5.116	1.334	2.336	.333	.077	9.196
1954	5.523	1.485	3.033	350	.075	10.466
1955	5.727	1.403	3.390	.318	.073	10.911
1956	5.826	1.648	3.603	.335	.072	11.484
1957	5.955	1.915	3.886	.375	.117	12.248
1958	6.614	1.614	3.713	.344	.161	12.446
1959	6.317	1.753	3.877	.449	.135	12.531
1960	6.708	1.535	3.903	.484	.352	12.982
1961	6.579	1.680	3.726	.475	.410	12.870
1962	6.182	1.849	3.584	.317	.275	12.207
1963	6.378	1.332	3.755	.476	.269	12.210
1964	*6.192*	*1.313*	*4.035*	*.489*	*.265*	*12.194*

Source : Table 1 plus meat equivalent of livestock net export (D.G. Animal Resources and Veterinary Services, Baghdad, Iraq).
Note : In this case, the per capita supply = per capita consumption + per capita net export

Table 3. National Income, implicit Price Index, Population and Per Capita Income, Iraq, 1953—1964.

Year	National[a] Income (Million ID)	Implicit[a] Price Index 1956=100	National[a] Income 1956 Prices (Million ID)	Population[b] Million Persons	Per Capita Income (ID)
1953	245.9	92.7	265.2	5.864	45.2
1954	285.8	88.6	322.5	6.000	51.9
1955	291.2	96.6	301.4	6.136	49.1
1956	337.6	100.0	337.6	6.272	54.3
1957	355.4	101.0	351.8	6.408	54.9
1958	378.7	103.2	367.0	6.544	56.1
1959	396.1	106.3	372.6	6.680	55.6
1960	449.7	106.0	424.1	6.816	62.2
1961	485.7	103.3	470.3	6.952	67.6
1962	527.7	104.7	504.0	7.088	71.1
1963	573.3	105.9	541.3	7.244	74.7
1964	622.8	107.1	581.5	7.360	79.6

(a) Adapted from (Estimates of the National Income in Iraq, 1953—61) by Dr. K. Haseeb
Note : The 1962, 1963 and 1964 figures were based on the 1953—61 estimates.

(b) The population estimates are based on the population census for the years 1957, 1947, and 1934, compiled by the General Bureau of Population Census, Baghdad, Iraq.

a yearly rate of about 2%, during the years indicated above (Table 3). Thus, the changes in the values of the price determining factors appear to be favorable for a rapid rate of increase in meat prices. It may have been for these reasons that the mutton and beef prices have increased at yearly rates of 7.5% and 10% respectively (Table 4).(*)

Several price estimating equations were derived from the mutton and beef data. Two of these equations were found to fit mutton and beef data best (Footnote Table 5). Due to a high intercorrelation among the independent variables, the standard errors of the individual regression coefficients were relatively high (Table 5). For this reason, care must be exercised in interpreting the regression coefficients.

The values of the price determining factors were projected to 1975. These values were inserted into the price estimating equations in order to project

(*) Due to lack of price data for goat, buffalo, and camel meats emphasis was placed on mutton and beef price analysis.

Table 4. Actual and the Estimated Per Kilogram Prices of Mutton and Beef, 1953—1964, Iraq, Projected to 1975.

Years	Mutton		Beef	
	Actual Price(a) Fils	Estimated Price(b) Fils	Actual Price(a) Fils	Estimated Price(b) Fils
1953	167	164	121	114
1954	187	180	134	147
1955	185	193	140	139
1956	208	208	161	162
1957	233	225	172	163
1958	213	226	166	176
1959	227	243	169	173
1960	256	250	206	204
1961	296	262	242	226
1962	242	276	239	238
1963	298	289	245	254
1964	317	314	268	268
1975	—	444	—	359

(a) Source : Price data were obtained from :

(1) Statistical Abstracts of the Ministry of Economics, Baghdad, Iraq (1953—56).

(2) Publications of the Chamber of Commerce, Baghdad, Iraq (1953—56).

(3) Price data for 1957—1964 were obtained from the Weekly Price Reviews of the Dept. of Agric. Economics, Ministry of Agriculture.

Notes : For the years 1953—1956, the price data was available for the liwas of Mosul, Baghdad and Basrah only. However, price data for all 14 Liwas of Iraq were available for the years 1957—64. For this reason, regional prices were adjusted for the years 1953—56 in the light of the 1957—64 data.

The data in the above table is weighted average of the retail meat prcies by regions in Iraq. The original data was deflated by the implicit price (See Table 3 for the implicit price index).

(b) See footnote Table 5.

Table 5. Simple Correlation Matrix for the Variables Included in the Study

	X_1	X_2	X_3	X_4	X_5	X_6
X_1	1.00	.95	.93	.72	.71	.93
X_2		1.00	.97	.71	.66	.98
X_3			1.00	.80	.74	.96
X_4				1.00	.92	.65
X_5					1.00	.62
X_6						1.00

Price Equations :

Mutton (a) $X_1 = 156.427 + \underset{(149.743)^*}{12.725X_3} - \underset{(-0.725)}{15.05_2X_4} + \underset{(0.786)}{23.803X_5}$

$R^2 = 0.88$

Beef (b) $X_2 = -102 + \underset{(1.324)}{12.509X_3} - \underset{(-0.620)}{9.170X_5} + \underset{(35.30)^*}{4.159X_6}$

$R^2 = 0.97$

Where :

Figures in Parantheses are t — values

X_1 = Fils/Kilogram

X_2 = Fils/Kilogram

X_3 = Years (1953 = 1, 1954 = 2 . . . 1964 = 12)

X_4 = Kilograms of mutton per person (net supply)

X_5 = Kilograms of beef per person (net supply)

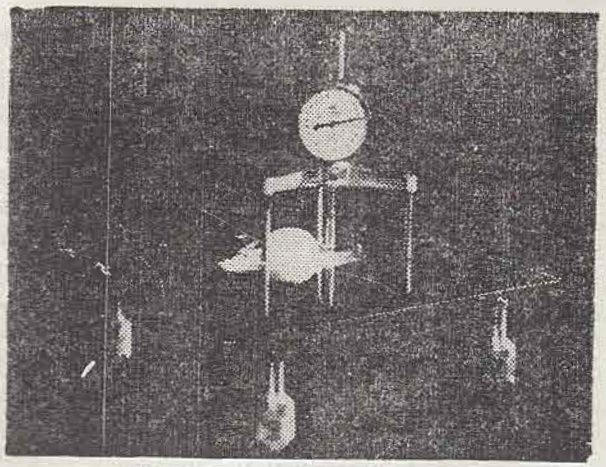
X_6 = per capita real income (ID/person)

*Significantly different from zero at 1% probability level.

mutton and beef prices to 1975. Mutton and beef prices are expected to be about 440 and about 360 Fils, respectively, in 1975, an average yearly rate of increase of about 7% during 1964—75 (Table 4).

DISCUSSION

From the preceding discussion, it can be concluded that the mutton and beef prices have increased at relatively rapid rates during the past years. The



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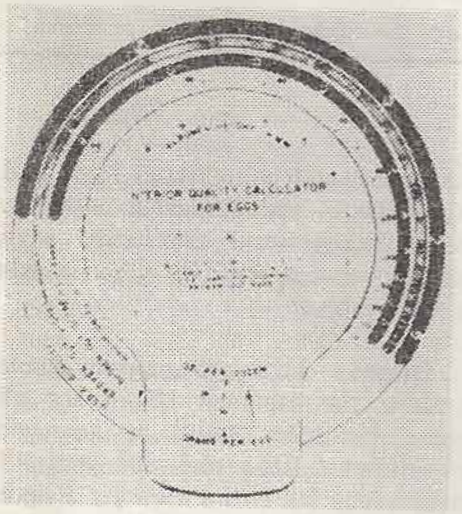
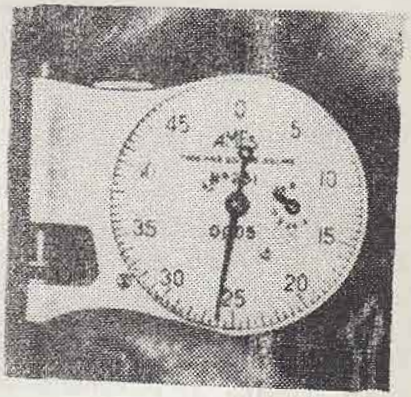


Interior egg quality Calculator



The last approach appears to be the most appropriate technique to be followed, since it stabilizes meat prices and results in an increase in farm income in the long run.

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CHEMICAL COMPOSITION AND NUTRITIVE VALUE OF SOME IRAQI FEED-STUFF

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SUMMARY

1. Feeding experiments were carried out on sheep in metabolic cages where the digestion coefficients were calculated, and total digestible nutrients and starch values were established.
2. Alfalfa hay and green showed high Protein where digestible protein was 10.36% for hay and 2.93% for green.
3. Barley and wheat straw showed low protein content and very high fibre content.
4. Nutritive Ratios for alfalfa hay, green, barley straw and wheat straw were 3.92, 3.99, 328.4, and 332.6, respectively.

الخلاصة

تعتبر تغذية الحيوانات من الامور المهمة لانعاش الانتاج الحيوانى وهذا يعتمد على عوامل كثيرة اهمها تحليل المواد الذائية لمعرفة قيمتها الغذائية ٠

لقد اجريت التجارب فى كلية الزراعة لتقدير القيمة الغذائية لبعض المواد العلفية الغير مركزة على الاغنام باعداد الصناديق الملائمة لهذه الدراسة ٠ وقد وجد بأن النتائج مقاربة لبعض النتائج التى حصل عليها لتحليل بعض المواد العلفية فى الخارج ٠

كانت نسبة المواد المعدنية والبروتين عالية فى الجت الاخضر ٠ أما عن الالياف فكانت نسبتها مرتفعة فى التبن ٠ ووجد كذلك بأن نسبة الدهن واطئة فى المواد العلفية التى درست ٠ أما عن السكريات فكانت مرتفعة فى الحنطة والشعير ٠

INTRODUCTION

Establishing a new system for preparing adequate rations for feeding animals is urgently needed in Iraq. This system requires an exact scientific survey, which is lacking as to the chemical composition, nutritive value and practical potentialities of all different local feeds used for animals and poultry.

Inadequate data of some of these feedstuffs became available in recent years. This indicated an urgent need for wide study on the chemical composition, digestion coefficient, Digestible Protein, Starch Value as Kellners' Theory (4), and the Total Digestible Nutrients as Morrison's Standards (5), which is the aim of this work.

No such work had been carried out in Iraq before, except few experiments were carried out by Richter and Becker (7) and (8) on dates and its by-products.

Therefore, it was found necessary to conduct such studies in Iraq. This work was carried out for the first time on some local feedstuff using Awassi

sheep under similar environmental conditions which helped us to initiate a plan of research on all local feedstuffs which are needed for further establishment of animal rations required for all types of production such as meat, milk, wool and egg production on a scientific basis.

This study may help in determining the mineral balances in different types of farm animals.

This paper forms Part I on the study of roughages as alfalfa, green and dry as hay, barley straw, and wheat straw.

MATERIALS AND METHODS

A. Chemical Analysis :

Methods of analysis for moisture, crude protein, crude fat, crude fibre and mineral matters are those used by Ghoneim et al (2), while nitrogen free extractive is calculated by difference for all feeds and faeces. Results were calculated as fresh food offered to animal also calculated in total dry matter.

B. Digestibility Trials :

Animals used in the experiments were mature castrated one year old Awassi sheep. Four metabolic cages were used at a time and the experiment was carried out in duplicate and the results were averaged for the same feed. The system of experiment applied was that explained by Ghoneim and Raafat (3).

Urine and faeces were collected daily during the twelve days of the experiment.

Best results were obtained by the use of the metabolic cages which were specially designed by Raafat as shown in Figures (1) and (2).

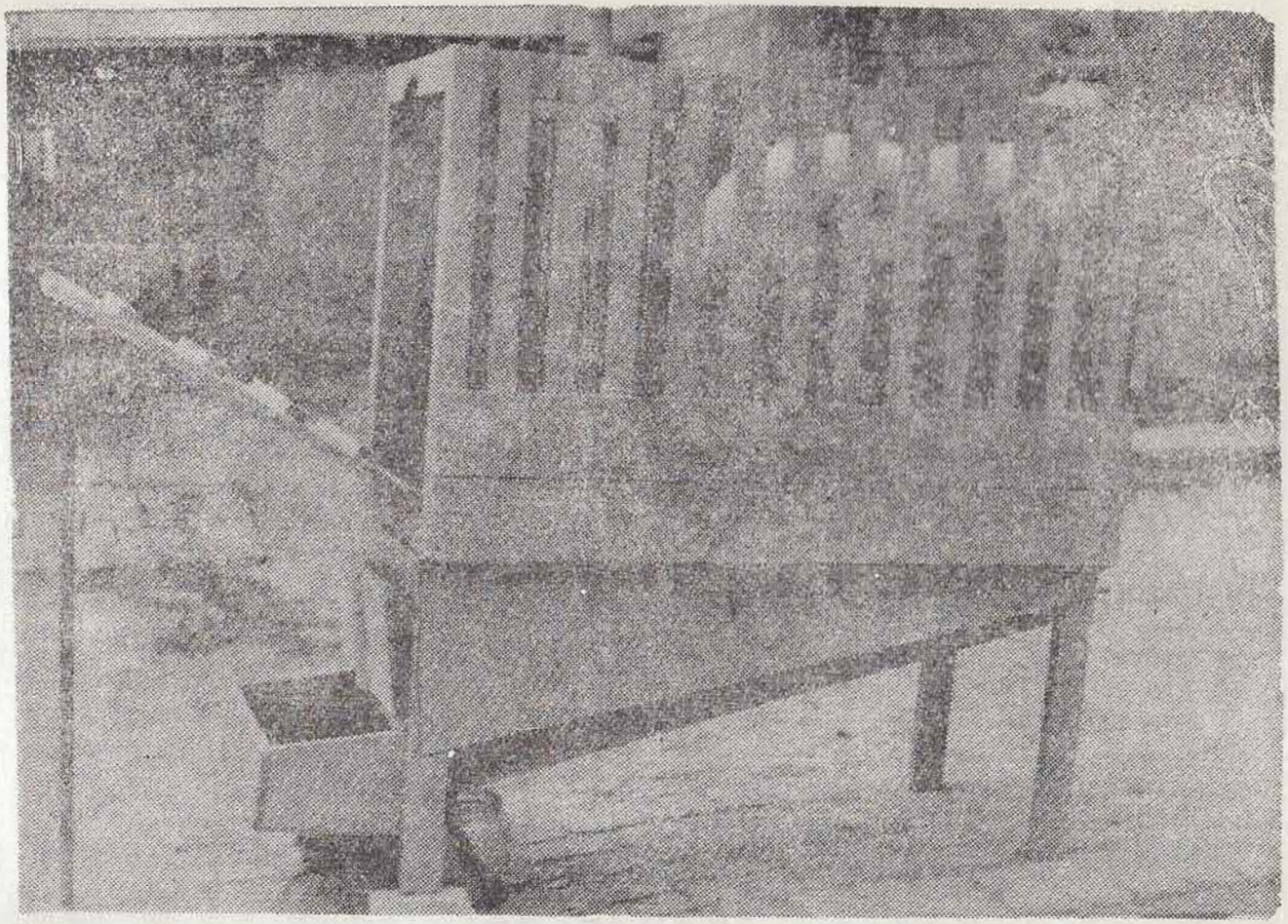

Fig. 1
General view of the Metabolic Cage designed for the determination ofdigestibility of feedstuffs in the Animal Production Research Station, Collegeof Agriculture, Abu-Ghraib.

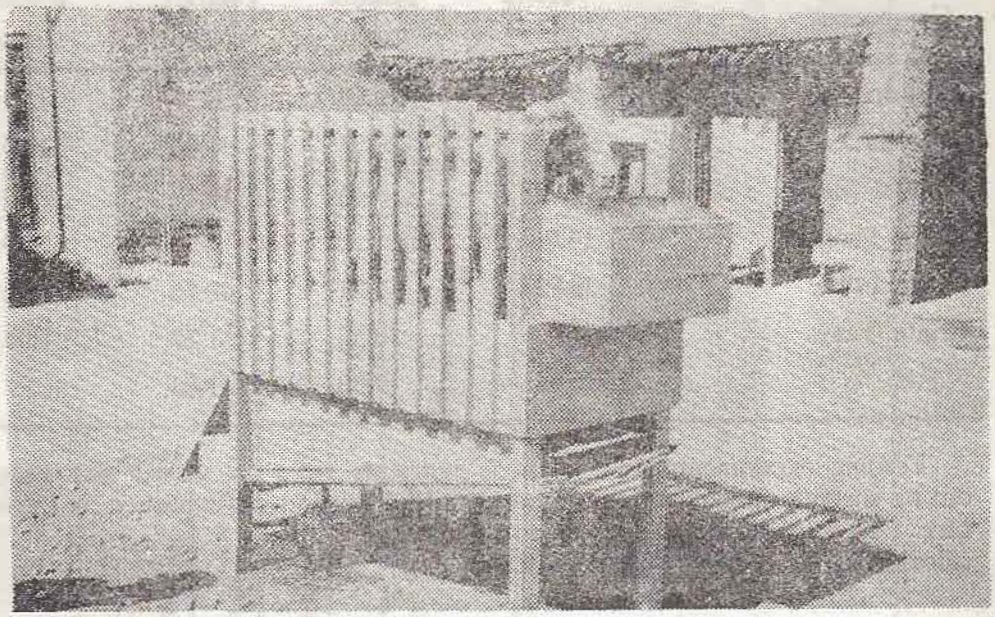

Fig. 2

Side view of the modified metabolic cage using sheep showing the system of urine collection, and boxes for offering food and water to animals in the experiment.

The cages were so constructed that food and water were spaced apart, while faeces and urine can be collected separately every day during the experiment. The cages were also made to stand the local conditions in Iraq and may be used for feeding green fodders as well as dry concentrates.

Four digestibility trials were conducted on alfalfa green (one year, 2 years, 3 years, and mixed cuts) as well as alfalfa hay, barley straw, and wheat straw.

RESULTS AND DISCUSSIONS

This is a study to investigate and establish the chemical composition of the four different roughages, the data of which are tabulated in Table 1.

Table 1

Component	Alfalfa Hay	Alfalfa green	Barley straw	Wheat straw
Moisture	9.33	79.09	8.34	8.00
Dry Matter	90.67	20.91	91.66	92.00
Mineral Matter	11.234	2.45	9.17	9.43
Crude Protein	14.063	3.52	2.33	2.89
Crude Fibre	30.928	5.21	40.86	41.72
Crude Fat	3.609	0.53	1.27	1.04
N.F.E.	30.836	9.30	31.03	36.92

Feeding experiments were carried out on sheep in metabolic cages where the digestion coefficients were calculated. Accordingly, the digestible nutrients were calculated and starch values were also established as shown in Table 2.

Table 2

Feedstuff	Digestible Protein	Starch Value	T.D.N.
Alfalfa Hay	10.36	31.34	50.55
Alfalfa Green	2.93	12.65	14.62
Barley Straw	0.12	15.12	39.53
Wheat Straw	0.01	9.09	33.27

The starch value was calculated after Kellner (4) using his factors and his fibre deduction tables.

Appendix I and II show the final results of these experiments.

These results showed that alfalfa whether green or dry as hay is high in protein content where the digestible protein for hay 10.36% and 2.93% for green. These results as well as S.V. & T.D.N. agree with many research workers (5), (6) & (9). The same figures were also obtained for starch value and digestible protein.

APPENDIX No. I.

General Summary for the Experimental Data of Digestible Protein, starch value after deduction, (Kellner) and Total Digestible Nutrients (Morrison.)

Feedstuff	Digestible Protein		Average	Starch Value (Kellner)		Average	Total Digestible Nutrient		Average
	Sheep 1.	Sheep 2.		Sheep 1.	Sheep 2.		Sheep 1.	Sheep 2.	
Alfalfa hay	10.44	10.29	10.39	31.93	30.75	31.34	51.16	49.94	50.55
Alfalfa green	A–2.97	A–2.74	2.93	A–13.26	A–13.11	12.65	A–14.68	A–14.83	14.62
	B–2.79	B–3.21		B–13.00	B–11.21		B–14.68	B–14.28	
Barley straw	0.01	0.24	0.12	16.27	13.97	15.12	40.02	39.04	39.53
Wheat straw	0.02	0.01	0.01	8.70	9.47	9.09	33.03	33.56	33.27

APPENDIX No. II

Composative Study on the Experimental Data obtained and other workers.

Authors	ALFLFA HAY			ALFALFA GREEN			BARLEY STRAW			WHEAT STRAW		
	D.P.[1]	S.V.[2]	T.D.N.[3]	D.P.	S.V.	T.D.N.	D.P.	S.V.	T.D.N.	D.P.	S.V.	T.D.N.
This Work	10.28	31.34	50.55	2.93	12.65	14.62	0.12	15.12	38.53	0.01	9.09	33.27
Average Figures in Iraq.	12.67	26.09	43.27	3.46	12.43	14.35	1.65	20.50	14.49			
Morrison Feeds and Feeding	10.03	32.307*	50.40	3.4	10.298*	14.7	0.7	20.17	42.2	0.3	17.946	40.6
Ghonein and Raafat (Egypte[d])							0.90	21.80				
Feeding Arbic Text Book 1955.							1.90	21.8		1.14	26.31	
(N.R.C.) U.S.A. Publication 504	10.09		50.07				0.7		42.2	0.3		40.6
B.N. Schneider Feeds of the world.	10.09		50.06	2.7		14.5	0.6		39.5	0.2		38.1

1— D.P. = Digestible Protein.

* Calculated Figure.

2— S.V. = Starch Value (Kellner).

3— T.D.N. = Total Digestible Nutrients. (Morrison).

In case of barley straw the results showed that it is very low in digestible protein (0.12%) while the S. V. and T. D. N. are 15.12% and 39.53% respectively.

Although these figures are lower than those obtained by (5), (6) and (9), yet they are still close to the results obtained.

Wheat straw showed the lowest figures of all the four feedstuff experimented on and they are lower than those of (5), (6) and (9). Further study is needed to clarify these results. This will be re-experimented on to establish the new figures for wheat straw to be compared with the other results.

Alfalfa hay and green showed high protein content where digestible protein was 10.36% for hay and 2.93% for green.

Barley and wheat straw showed low protein content and very high fibre content.

Nutritive ratios were calculated for alfalfa hay, green, barley straw, and wheat straw and were, 3.92, 3.99, 328.4 and 332.6 respectively.

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2. Summary : Each paper should start with a brief but informative summary of its content both in English and Arabic. The English summary comes first. The word "SUMMARY" should be typed in capital letters in the centre of the page.

3. Text : The text should contain the following sections in this order: Introduction, Materials and Methods, Results, Discussion, and Acknowledgment, if any. The heading of each section should be typed in capital letters and centred. For the sake of uniformity in reporting, the following points should be followed : (a) use names not formulas for chemical compounds, (b) use % rather than percent. (c) repeat the degree sign. ex.: 5°—10°C., (d) place zero before the decimal points for fractions. ex.: r=0.95, (e) use one asterisk (*) to mark statistical values which exceed 5% level and two asterisks for those exceeding 1% level, (f) use plural verbs with quantities and place figure before abbreviations. ex.: 6.9 g. were used... (g) All units are abbreviated according to the notations given in the Handbook of Chemistry and Physics editted by Lange (Latest edition).

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