

**MANGANESE, IRON AND COBALT CONTENT
IN COMMON EGYPTIAN FEEDSTUFFS**

By

E.R.M. ABOU-HUSSEIN, M.A. RAAFAT, A.K. ABOU-RAYA
AND A.S. SHALABY*

A study of three important elements manganese, iron and cobalt was undertaken to show their content in some common Egyptian feed-stuffs. The results indicate that clover and straws were adequate in both iron and manganese. Barley grains and cotton seed cake contain sufficient amounts of both iron and cobalt. Brans are adequate in these three elements, but corn grains are poor in them.

Supplementing manganese appeared necessary in poultry rations relying on high contents of maize grains. It is unlikely with ruminants fed on a variety of feeds containing roughages and other concentrates by-product to need manganese supplementation except with sheep.

Iron deficiency seemed unlikely to occur in view of its liberal amounts in most feeds exceeding any conceivable requirements.

A ration containing wheat straw, maize grains and coarse wheat bran or broad beans might prove unsatisfactory for adequacy of cobalt content for ruminants.

Further investigations using comparative feeding experiments is urgently needed to come to a clear recommendation in practice under local conditions.

The subject of mineral content in feeds, retention by farm animals and requirements under local conditions and interrelation between elements called for urgent studies in U.A.R. newly reclaimed areas either in the desert in certain valleys or up north, needs careful studies on mineral contents of produced crops under such conditions along with nutritional effects related to animals. There is also a strong feeling about the effect of the High Dam on depriving irrigating water from some of the silt and clay particles which form a continual source of essential elements for plants and livestock. Therefore, nutritionists in U.A.R. became more scared about the possibility of mineral deficiency symptoms or over dosing under such circumstances.

This study was carried out to estimate the amounts of these elements in Egyptian feeds. This might give information about their adequacy in common rations offered to animals under local condition. The contents

* Animal Production Department, Faculty of Agriculture, Cairo University.

of these elements in different feeds were reported by Ahmed and Mc Collum (1939) Ghoniem (1964), Kellner-Becker (1963), Morrison (1948), Obakhovo & Pirogovo (1962), Schaible *et al.* (1938), Shambley and Jacobson (1955), and Underwood (1962). These mineral requirements for farm animals were recorded by Askew (1939), Blaxter *et al.* (1927), Gubinskaya (1962), Couch *et al.* (1947), Crampton (1956), Gallup and Norris (1934), Grumer *et al.* (1950), Marston *et al.* (1948), Matron *et al.* (1957), Maynard and Loosli (1961), Murty (1957), Reid *et al.* (1947) Smith and Ellis (1947), Thompson and Ellis (1947), Underwood (1962), and Wilgus *et al.* (1937).

Material and Methods

Representative samples were taken from the following feedstuffs : clover (1st, 2nd, and 3rd cut), green corn plants (darwa) clover hay, wheat straw, seeds from corn (*Zea mays*), barley and broad beans, decorticated and undecorticated cottonseed cake, rice bran, and both fine and coarse wheat bran. Preparation of samples for chemical analysis was carried out according to the method of Ghneim *et al.* (1952). The method of Rinkis (1961) was applied for manganese determination with small modification. The sample was ashed in a porcelain dish at 500°C for 2 hours, the ash was then moistened with 0.5 ml conc. HNO₃ and put in a Muffle furnace for 2 hrs. at 500°C. It was then dissolved in 0.3 ml conc. HNO₃ and 10 ml H₂O, then 0.5 ml H₂SO₄ and 0.5-1.0 ml 85% H₃PO₄ were added and the sample was heated gently for about 5 minutes. 0.5 ml AgNO₃ 2% and 0.1-0.2 gm K₂ S₂ O₈ were added and the sample was boiled. The addition of K₂ S₂ O₈ was repeated and subsequent boiling (1 or 2 times) until a stable pink colour was developed which was diluted to known volume and compared with standards. Total iron was estimated by the O. phenanthroline colorimetric method by Jackson (1962). Cobalt was determined by using Nitroso — R — Salt as described by Vogle (1964).

Results and Discussion

1.—Manganese content in feeds :

The first, second, and third cut clover and clover hay contained the highest amounts (83.1, 110.5, 103.6 and 87.4 p.p.m. respectively), while the lowest values were in wheat straw and green maize plants (57.2 and 45.8 p.p.m.). With concentrates, ordinary maize yellow maize, barley and broad beans contained low values of Mn (7.2, 7.4, 19.1 and 22.3 p.p.m. respectively). Rice bran, coarse and fine wheat bran contained relatively high values approaching those of clover and its hay (98.5, 95.3, and 83.2 p.p.m. respectively) as shown in Figure (1). The results indicate that grains contained the lowest values (7.2-22.3 p.p.m.) followed by cottonseed by-products. Green corn plants and wheat straws have medium values (45.9-57.2 p.p.m.) while clover and its hay as well as rice bran and milling by-products indicate relatively high values (33.1—110.3 p.p.m.). In this connection Schaible *et al.* (1938) indicated that corn is very low in Mn content when compared with all other cereals.

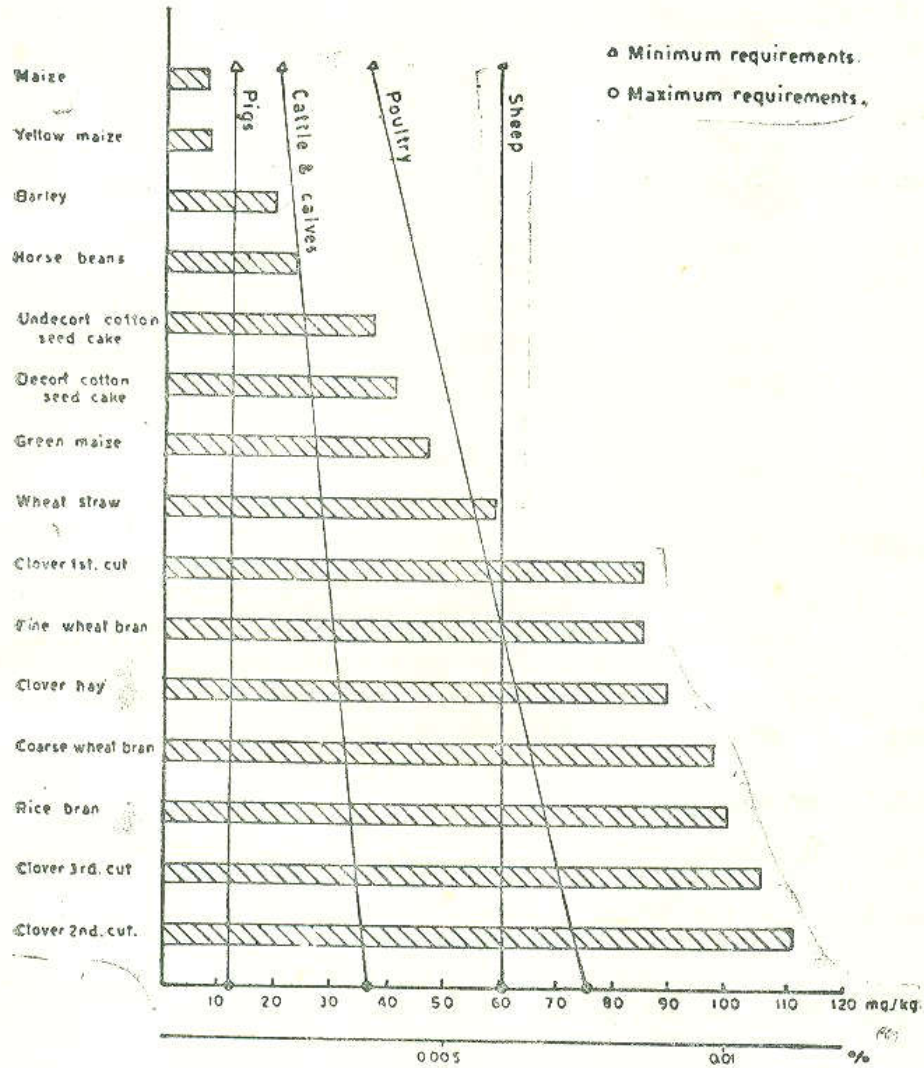


FIG. 1.—Manganese content in dry matter of common feeds.

Regarding the results obtained in this study and Mn requirements for farm animals recommended by several authors mentioned above (ca. 20 p.p.m. for cattle up to 71 p.p.m. for hens), supplementing manganese appeared necessary in poultry rations relying on high contents of maize grains. It is unlikely with ruminants fed on a variety of feeds containing roughages and other concentrate by-product to need manganese supplementation. Comparative feeding experiments appeared necessary particularly with poultry.

2. Iron content in feeds :

Among roughages, the first, second, and third cut clover and its hay contained the highest amounts (201.3, 314.5, 254.9 p.p.m. respectively). The lowest values were in green corn plants and wheat straw (152.7 and 92.2 p.p.m.) Grains and beans contained the lowest amounts of iron compared with roughages or other concentrate by-products as shown Figure (2). Figure (2).

Regarding animal requirements for iron stated by Crampton (1956), Maynard and Loosli (1961), Blaxter *et al* (1957), Matron *et al* (1957) and Chubinskaya (1962), it was found to be about 20 p.p.m. in dry feed for beef cattle, sheep, swine and chick up to 50 p.p.m. in dry feed (for dairy cattle). It can be seen that the common Egyptian feedstuffs analyzed contain sufficient amounts of iron to over the livestock requirements except with maize grains. This is in good agreement with the results of Underwood (1962). Iron deficiency seems unlikely to occur in view of its liberal amounts in most feeds exceeding any conceivable requirements.

3. Cobalt content in feeds :

Figure (3) indicates that wheat straw and first cut clover contained the lowest amounts of cobalt (0.04 and 0.07 p.p.m. on dry matter basis). The highest level was that in green corn plants which contained about 0.23 p.p.m. on dry matter basis. The second cut clover contained more cobalt than that in the two other cuttings but the third cut was richer than the first one. It can be noticed that concentrates contain more cobalt when compared with roughages. This is in good agreement with Schambye and Jacobson (1955) findings Barley grains contained the highest level (0.29 p.p.m.), while broad beans and coarse wheat bran contained relatively the lowest level (0.11 p.p.m.). It can be noticed also that yellow maize grains contained more cobalt than white maize grains.

In connection with cobalt requirements, Askew, (1936) found that sheep when received 8 mg cobalt (as COCl_2) weekly for one year remained perfectly healthy and weighed approximately 30% more than did comparable animals that received no cobalt. Seilder (1957) obtained the highest daily gains in his experiments with sheep when normal rations were supplemented with

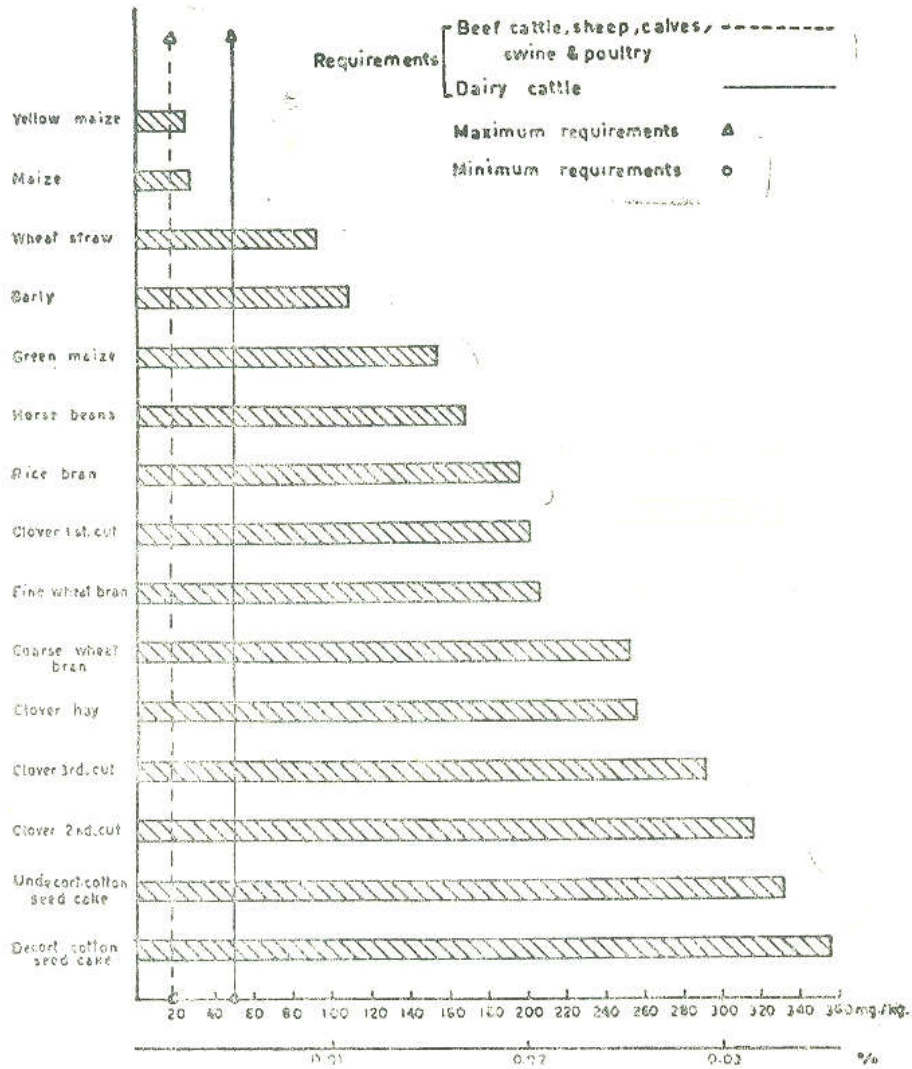


FIG. 2.—Iron content in dry matter of common feeds.

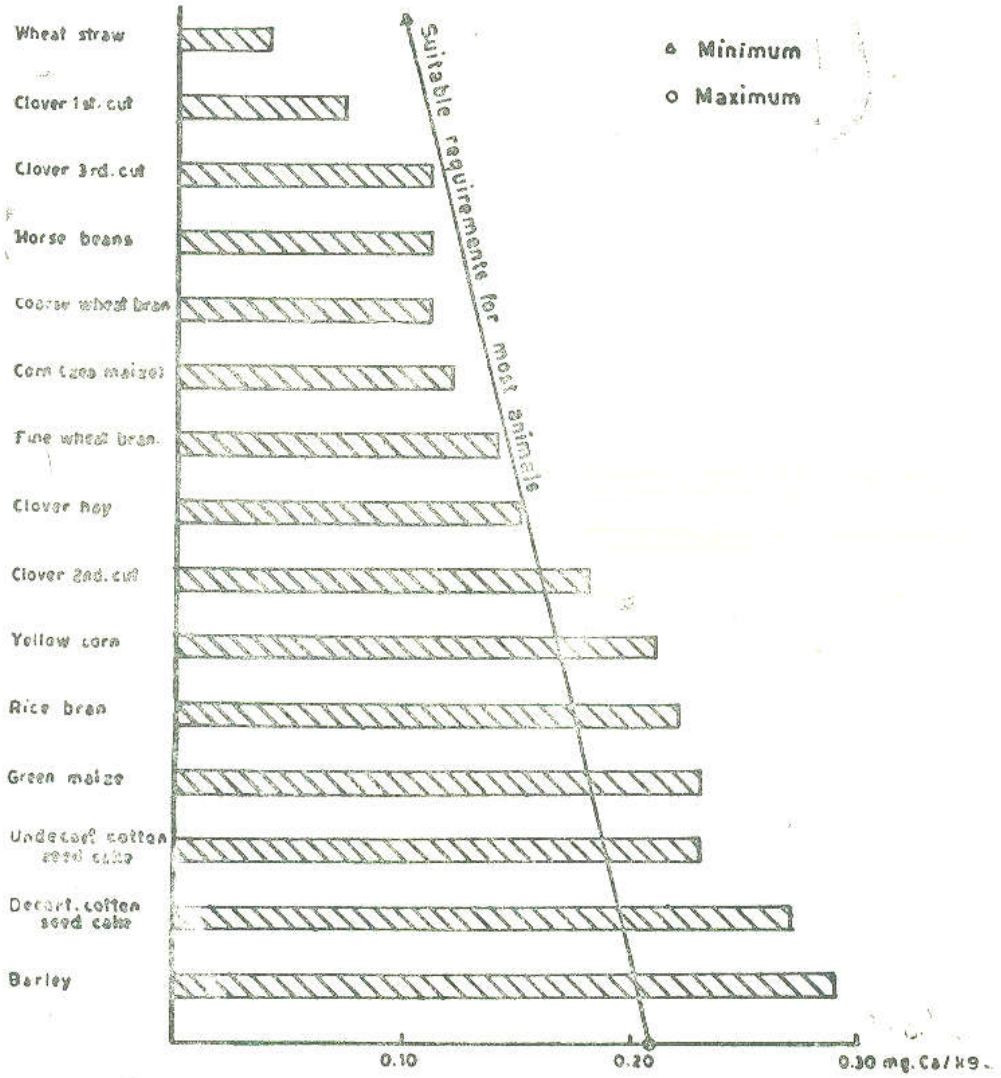


FIG. 3.—Cobalt content in dry matter of common feeds.

1.0 mg cobalt and 10 mg copper per head daily. Harley and Beck (1953) cleared that cobalt deficiency in cattle and sheep occurred in regions where samples of pastures had cobalt concentration ranging from 0.03 to 0.12 p.p.m. Chubinskaya (1962) suggested that the optimum level for calves at the age of 4—6 months is 2 p.p.m.

Generally with view to cobalt requirements and the good results obtained by cobalt salts additions, along with the results in this study in some common feedstuffs, it appeared advisable to add cobalt salts as supplements to animal rations. Some Egyptian roughages contain less cobalt than usually recommended in the feed dry matter as first cut clover and wheat straw. Some roughages (3rd cut clover) and concentrates (broad beans, white maize, and coarse wheat bran) contained marginal amounts if 0.1 p.p.m. is taken as a standard. A ration containing wheat straw, maize grains and coarse wheat bran or broad beans might prove unsatisfactory for adequacy of cobalt contents. Comparative feeding experiments are urgently needed to come to a clear recommendation in practice under local conditions.

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دراسة مدى احتواء مواد العلف المصرية على المنجنيز والحديد والكوبلت

دكتور السيد رفعت أبو حسين - دكتور أحمد كمال أبو ربه -

دكتور محمد رافت - عادل شلبي (*)

المخلص

أجرى هذا البحث لتقدير كمية المنجنيز والحديد والكوبلت في مواد العلف المصرية الشائعة وهي البرسيم والذراوة ودريس البرسيم وتبن القمح والذرة الشامية والذرة الصفراء والشعير والفول ورجيع الأرز والرذة الناعمة والخشنة وكسب بذرة القطن بنوعيه المقشور وغير المقشور .

وقد وجد في مواد العلف الخشنة أن دريس البرسيم والبرسيم تحتوى على مستوى عال من المنجنيز ، أما الذراوة والتبن فتحتموى على كميات أقل . وفي مواد العلف المركزة وجد أن الذرة الشامية والذرة الصفراء والشعير والفول تحتوى على كميات قليلة جدا من المنجنيز فى حين أن رجيع الأرز والرذة الناعمة والخشنة فتحتموى نسبيا على كميات أعلى تقارب تلك الموجودة فى البرسيم والدريس . ومن الاحتياجات التى سجلها بعض الباحثين لحيوانات المزرعة عن المنجنيز ومقارنتها بكمية المنجنيز فى مواد العلف المصرية وجد أن اضافة المنجنيز تبدو ضرورية خصوصا فى علائق الدواجن التى تحتوى على كميات كبيرة من الذرة الشامية الفقيرة فى المنجنيز . أما بالنسبة لباقي حيوانات المزرعة فلا ينصح بالاضافة الا فى حالة الأغنام خصوصا اذا كان المرعى فقيرا ومكونات العليقة من مواد العلف الفقيرة فى المنجنيز كالذراوة وحبوب الذرة والشعير والفول .

وفى حالة الحديد وجد أن البرسيم ودريسه يحتويان على أعلا نسبة من العنصر فى المواد الخشنة أما الذراوة والتبن فيحتويان على كميات أقل وعموما كان الحديد فى المواد الخشنة مرتفعا . وفى المواد المركزة كانت أقل

(*) قسم الانتاج الحيوانى « فرع تغذية الحيوان » بكلية الزراعة - جامعة القاهرة -

النسب موجودة في الذرة الشامية والذرة الصفراء واعلاها كسب القطن والردة . ولما كانت احتياجات حيوانات المزرعة من الحديد التي سجلها بعض الباحثين منخفضة ، كما أن لهذا العنصر طبيعة خاصة في تمثله الغذائي بالجسم ، إذ أن للجسم قوة فائقة على الاحتفاظ به ، يمكن منه أن نستنتج أن مواد العلف المصرية تحتوي على كميات من الحديد تكفي لمواجهة احتياجات الحيوانات من هذا العنصر .

أما بالنسبة للكوبلت فقد وجد أن المواد المركزة تحتوي عليه بنسبة أعلى الخسنة . ومن احتياجات الحيوانات من هذا العنصر التي سجلها الباحثون للمجترات ومن مقارنتها بكميته في مواد العلف المصرية قد ينصح بإضافة جزء من أملاح الكوبلت لملائق الحيوانات لضمان عدم نقص النمو أو الإنتاج بسبب أي نقص محتمل من الكوبلت .

ومن هذه الدراسة الأولية عن كمية هذه العناصر في مواد العلف المصرية يتضح أنه يلزم امتداد البحوث عليها وأجراء تجارب مقارنة على الحيوانات للوصول إلى أنسب الاحتياجات الفعلية تحت الظروف المحلية .