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A STUDY ON THE SOIL TARE OF SUGAR BEET IN KONYA

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ABSTRACT

The soil amount transported to the sugar factories is a major problem in sugar beet growing. The analysis of the data obtained from the Konya Sugar Company indicated that the amount of soil carried away from the sugar beet fields was a very important issue in Konya. As an average of 2000 year the percentages of soil tares was estimated as 8 % in sugar beet harvesting in Konya. These means that approximately 256 953 tons of soil were transported from the sugar beet fields annually in Konya. The high amounts of soil delivered to the sugar factories and weighing sites not only causes a kind of land degradation (soil erosion) but also increases the cost of handling and consequently white-sugar prices, on the other hand, the adhering soil is very rich in organic matter content as well in major and minor plant nutrients.

Ten adhering soil samples were collected from ten different sugar beet delivery sites in November 2000, soil analysis showed that about 9 096 tons of organic matter, 43 tons of total N, 2.4 tons of available P (P_2O_5) and 22 tons of extractable K (K_2O) were carried away in 256 953 tons of transported soil from the sugar beet fields in Konya province. From the economical and ecological points of view the transport of soil from the sugar beet fields should be minimised by using improved methods of cultivation, mechanisation and plant breeding and also sugar beet growers should be enlightened about the importance of soil tare reduction in sugar beet growing.

Key Words: *Soil carrying, sugar beet, Konya plain.*

KONYA'DA SEKER PANCARI HASADI ILE TOPRAK TASINIMI ÜZERINE BIR ARASTIRMA

ÖZET

Seker pancari yetistiriciliginde tarlalardan seker fabrikalarina tasinan toprak miktari büyük bir problemdir. Konya Seker Fabrikasindan elde edilen veriler, Konya'da seker pancari tarlalarindan tasinan toprak miktarinin çok önemli bir konu oldugunu göstermistir. Ortalama toprak darasi 2000 yili hasat döneminde % 8 olarak hesaplanmistir. Buna göre, Konya'da seker pancari yetistirilen tarlalardan yilda yaklasik 256 953 ton toprak tasinmaktadir. Tarlalardan seker pancari ile yüksek miktarlarda topragin tartim kantarlari ve fabrikalara gönderilmesi sadece toprak erozyonuna sebep olmakla kalmayip, ayni zamanda isçilik maliyetini ve sonuçta da seker fiyatlarini artirmaktadir. Diger taraftan, seker pancarina yapisik olarak tasinan toprak, organik madde ile makro ve mikro besin elementlerince en zengin topraktir.

Seker pancarlarinin tartima gönderildigi 10 farkli yerden Kasim 2000'de, pancarla tasinmis 10 toprak örnegi alinarak analiz edilmistir. Analizler sonucunda, Konya ilindeki seker pancari tarlalarindan tasinan 256 953 ton toprak ile 9 096 ton organik madde, 43 ton toplam N, 2.4 ton yarayisli P (P_2O_5) ve 22 ton ekstrakte edilebilir K (K_2O)'un da tasindigi belirlenmistir. Seker pancari tarlalarindan yumruyla birlikte tasinan topragin gelistirilmis kültivasyon, mekanizasyon ve bitki yetistirme metotlariyla minimuma indirgenmesi ve seker pancari yetistiriciliginde toprak darasinin azaltilmasinin önemi konusunda çiftçiler bilgilendirilmelidir.

Anahtar Kelimeler: *Toprak tasinimi, seker pancari, Konya Ovasi.*

INTRODUCTION

Both sugar beet which indispensable rotational crop in Central Anatolia production and sugar industry have a very significant role in Turkey's agriculture and agro-industry regarding to technological, economical and social development of rural population. Sugar beet growing area is around 360 000 hectares and about 12 300 000 tons of sugar beet is yearly processed by 27 sugar factories in Turkey. There is about 75 000 hectares of sugar beet growing area in Konya. And during the 2000 year campaign, around 3 524 846 tons of sugar beet have been processed by one the oldest sugar factories established at Konya in 1954 year (Anonymous, 2000).

Generally, in sugar beets considerable yield losses and costs occur during and after lifting the crop. The yield losses consist of root losses and sugar losses. The main costs caused at delivery of the beets to the sugar factory are brought about by the amount of tare. Apart from stones, weeds etc., it consist of top tare and dirt (soil) tare. According to the contract signed between the beet growers and Turkish Sugar Company, a regular 5 % deduction is applied for the top tare by the company on the total weight of the beet delivered to the weighing sites. The company experts at delivery sites visually evaluate amount of the soil tare. For determining the actual soil tare on disputed cases, randomly chosen beet samples are weighed before and after cleaning of the sampled beets.

In order to determine the efficiency of a cleaning machine (Armer Salmon HI-Vol) a series of tests were carried out at Ankara Sugar Factory in 1992. Reduction of soil tare varied from 34 % to 86 % depending on the weather conditions during the beet harvest time. It was reported that efficiency of cleaning machinery decreased from 57 % to 34 % due to the 13 mm of rainfall received before the beet-harvesting day (Sevilmis, 1992).

It was reported that cleaning efficiency of machines were approximately 62.67 %, the beet surface damage area was about 4.99 cm^2 and the machines increased the root breakage and caused the cracks on the beet surface (Kangal, 1998).

It was reported that the amount of soil delivered to sugar beet factories was a major problem in the Netherlands and as an average year, the percentage of soil tare varied from 5 to 15 % of gross weight of the sugar beet, representing the amount of 800 000 tons of soil coming from 115 000 hectares of beet growing area. The estimated costs of handling were Dfl 46 000 000. Beet growers paid 50 % of the costs directly; the other was settled in the beet price. Lifting principles without pressing soil to the beet dramatically reduced the amount of adhering soil just behind the lifter. In this research cleaning systems such as compressed air, brushes, stars and axial rollers were compared with conventional systems such as turbines and angers. The different system resulted in a reduction of 50 % of the soil tare on clay soils, on sandy soils; the reduction was 80 % (Van Der Linden, 1996).

Koch (1996) stated that 2-4 million tons of soil were transported from 500 000 hectares of sugar beet (4-8 tons/ha), yearly in Germany. In order to quantify the effects of several agronomical practices on soil tare of sugar beet, Koch (1996) evaluated data of various field trials. Contemporarily growing low tare varieties could reduce soil transported to sugar factories up to 20 % (relative). An even higher reduction was to be reached by mechanical cleaning (up to 60 %). Tillage and N-fertilizer supply only showed a small potential to lessen soil tare. Against this, raising plant densities leaded to increasing soil tare (3.6 % rel./10 000 pl.). It was noticed that unification of Germany was an overriding theme in the 1990 campaign. And average soil tare was fairly low at 13.93 %, but since the lowest value was 9.25, there was scope for further improvement (Bucholz and Schliephake, 1991).

It was indicated high costs in the sugar factories because of the soil delivered along with sugar beet carried a research on cleaning off dirt tare in advance by covering the beet clamps to ensure good drying, thereby improving cleaning. The average cleaning results of the exact tests 1988-95 showed a degree of cleaning of about 37 % with uncovered clamps, as opposed to 57 % with covered clamps, with films of polythene or polypropylene (Günther, 1996).

It was explained that tare depended on numbers of factors, which could be partially or fully controlled during the very first stages of growing. It was particularly at the time of harvesting that means of action were possible. Some factors increased or decreased the tare in overall manner, by adding or removing a more or less significant number of tare points depending on their importance: climate, soil type, soil moisture, leaf stripping, placing of the clamp. Other factors were instrumental by causing a constant variation of the dirt tare removed, more or less irrespective of conditions: yield populations, varieties, distance between rows, lifting devices, length of the cleaning circuit, pick-up depth, advanced speed, turbine rotation speed, clamp cleaning (Guiraud and Leveque, 1996). It was argued that plant breeding could contribute considerably by modifying the traditional morphology of the sugar beet root to reduce top tare and dirt tare in addition to improved methods of cultivation and mechanization. It was noticed that all sugar beet varieties had a conical root shape up till now. However it was thought that beets with a globe-shaped or oval root groves, unbranched, with narrow crown and with a smooth skin could decrease the losses and costs considerably. Although still too low in sugar content and juice purity, the 'tare-unfriendly sugar beet' was a great potential for further reduction of the amount of dirt tare and consequently a great potential for further reduction of production and processing costs (Guiraud and Leveque, 1996).

This study is aimed to indicate the importance of soil tare and plant nutrient losses in sugar beet harvesting in Konya. It was considered that these discussions might be useful for sugar factories, farmers and environmentalist in the context of sustainable growth.

MATERIALS AND METHODS

The amounts of soil tare were calculated from the data of Konya Sugar Factory Directorate. The compiled data of 2000 year about the sugar beet grown area, number of growers, yields delivered to the weighing-machine sites. The difference between the amount of beet delivered at those weighing sites by the growers and the amount of the beet processed by the sugar factories minus 5 % regular deduction for the top tare was considered as Soil Tare.

Ten adhering soil samples were collected from ten different sugar beet delivery sites in Konya on November 2000. The conventional methods were used for the analysis of the total organic matter (Walkley Black), total N (Micro Kjeldahl), available P (Olsen Method) and extractable K (1 N, pH=7 NH_4OAc) and microelements (atomic absorption spectrometer) levels of soils (Kacar, 1997).

RESULTS AND DISCUSSION

The amount of soil delivered to sugar beet weighing sites and sugar factories is a major concern in most of the sugar beet growing countries and Turkey. Results from analysis of the data obtained from the Konya Sugar Factory were given in Table 1.

The percentages of soil tare and soil losses in Konya were somewhat lower than these in Turkey. Because, for example, as it is easily seen in the Table 1, soil tare was 8.00 % in Konya, that was 10.24 % in Turkey (Oruç and Güngör, 2000). Weather conditions

of Konya are less rainy during the lifting period of sugar beet. So, much less adhering soil of sugar beet is expected in arid Konya, when compared to the other rainy region of Turkey in the fall. Urgently, detailed research is needed to clarify the every aspect of factors causing high soil tare in sugar beet lifting and beet transportation to the factories in Turkey. Chemical analysis results of the adhering soil samples and element losses values were given in Table 2.

As it is easily seen in the Table 2, the adhering soils removed from the surface layer of beet fields are not only rich in organic matter content, but also contain appreciable amounts of essential plant nutrients such as NPK and micro elements. So, higher amounts of adhering soil cause higher losses of organic matter and plant nutrient in addition to increasing the transportation costs of beet. Beside this, most unavoidable aspect is soil erosion that results in Unrecognised Land Degradation as year go on. From the stand point of sustainable agriculture the transport of soil should be minimized. Hence the farmers have to be convinced and enlightened on this vital issue, beside the use of improved methods of cultivation and mechanization in Turkey.

Table 1. Average Values of Sugar Beet Growing Area, Yield, Soil Tare, Soil Losses in Konya

	Konya	**Turkey** (Oruç and Güngör, 2000)
Harvested area (ha)	75 037	360 000
Yield (tons)	3 524 846	14 486 093
Soil tare (%)	8.00	10.24
Soil losses (tons/year)	256 953	1 483 337
Soil losses (tons/ha)	3.42	4.16

Table 2. Some Chemical Properties of Soil Samples Collected in Konya and Element Losses (n=10)

	Average Values	**Losses (Tons/year)**	**Losses (kg/ha)**
Organic matter (%)	3.54	9 096	121
Total N (ppm)	166.77	43	0.57
Available P (kg P_2O_5/da)	2.37	2.4	0.03
Extractable K (ppm)	70.28	22	0.29
Lime (%)	15.75	40 470	0.54
Fe (ppm)	9.68	2.49 (kg/year)	33.18 (mg/ha)
Cu (ppm)	1.44	0.37 (kg/year)	4.93 (mg/ha)
Mn (ppm)	143.41	36.85 (kg/year)	491.09 (mg/ha)
Zn (ppm)	2.24	0.57 (kg/year)	7.60 (mg/ha)

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