autonomic nervous system during various electrical and chemical conditions. It possibly is the cause of the condition known as cramp in human physiology and of other involuntary rigors seen in poisoning, etc.

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A NON-BITTER VARIETY OF MELILOTUS[1]

ONE of the chief disadvantages of sweet clover (Melilotus) as a forage plant is its lack of palatability. This is attributed to cumarin and closely related compounds of a phenolic nature which impart to the tissues an intensely bitter and stinging taste. Ever since the plant assumed economic importance a non-bitter form has been an object of search by sweet clover breeders.[2] It may be anticipated that the development of more palatable varieties will greatly enhance the agricultural usefulness of this recently domesticated but already widely cultivated plant.

The discovery at Madison, Wis., in 1933 of a non-bitter strain of Melilotus is the outcome of a systematic search for a variation of this kind which the author has made during the past five years among wild populations of *M. albus* Desr. and *M. officinalis* (L.) Desr. growing in that vicinity and in numerous stocks of American and foreign origin which have been under test at the Wisconsin Agricultural Experiment Station. All collections from North American sources have been found to be more or less strongly bitter to the taste. Likewise, a rather wide assortment of material from Western Europe was of similar character. Variations between plants in degree of bitterness were frequently encountered, but no individuals occurred in these lots which were inoffensive to the taste.

During the past season an opportunity was afforded of testing a collection of Melilotus made by Dorsett and Morse of the U. S. Department of Agriculture in China, Manchuria and Chosen in 1928. Acknowledgment is due Mr. L. W. Kephart, of the Division of Forage Crops and Diseases, U. S. Department of Agriculture, for kindly furnishing the seed of this collection. Wider variations in flavor were noted in the Asiatic than in the American and European stocks, but with a single exception the Oriental forms were all at least moderately bitter. F.P.I. No. 90753, the seed of which was designated Melilotus sp., proved, however, to be entirely free of the bitter, stinging taste characteristic of the genus. The determination of this unique quality was confirmed by several persons who visited the experimental field. Offspring of the original plants recently tested in the greenhouse were also non-bitter, whereas check samples of common white and common yellow sweet clover developed the usual distasteful flavor at an early stage of growth.

The original seed of F.P.I. No. 90753 was collected in the Botanic Garden near Peiping, China. The non-bitter plants are of annual habit, grow to a height of from 15 to 34 inches and bear small yellow flowers and smooth seeds. While some doubt attaches to the classification of the material, the race unquestionably belongs in the Coelorytis (Eumelilotus O E Schulz) section of the genus, and appears to be a variant form of the typically biennial species, *M. suaveolens* Ledeb. According to Schulz (*Bot. Jahr.*, 29: 660–735), *M. suaveolens* Ledeb. is closely related to *M. albus* Desr., and replaces the latter in Eastern Asia from Manchuria to French Indo-China.

R. A. BRINK

A NEW TYPE OF BROAD BASE TERRACE[1]

TESTS made at the Kansas Agricultural Experiment Station at Manhattan on small terraced and unterraced plats raise some serious questions concerning the value for soil and water conservation on uniformly sloping land of the type of terraces that have been widely used and recommended. Indications are that the principal value of this type of terrace (Fig. 1, A) is the prevention of gullies from cutting down

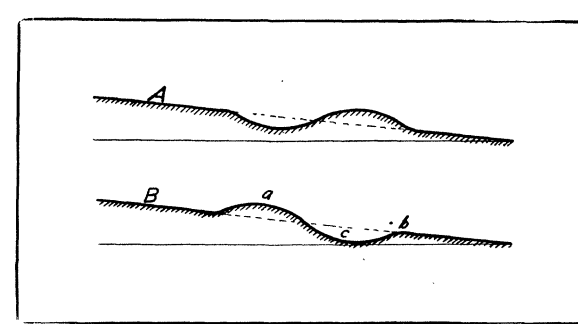

FIG. 1. A. Broad base terrace with channel above terrace. B. New type of terrace built from lower side. This gives no increase in slope above terrace. The water falling between a and b is caught in depression c and there is no run-off from this area.

[1] Papers from the Department of Genetics, Agricultural Experiment Station, University of Wisconsin, No. 173. Published with the approval of the director of the station.

[2] In a recent obituary of Erwin Baur, late director of the Kaiser Wilhelm Inst. f. Züchtungsforschung, München, Germany, R. R. Gates (*Nature*, 133: 239–240) states that this distinguished leader in genetics, whose untimely death is widely regretted, had found a cumarin-free strain of *Melilotus albus*. No report, other than that of Gates, of this independent and possibly contemporary discovery has been seen. Baur (*Landwirtschaftliche Presse*, August 16, 1933) states, however, that strains very low in cumarin have been found. It is not claimed that these are non-bitter.

[1] Contribution No. 232, Department of Agronomy, Kansas Agricultural Experiment Station.

the slopes. These tests were made on plats 6×50 feet and 3×200 feet, with a uniform slope of about 4 per cent. in only one direction. Terraces similar in shape and cross-sectional dimensions to the usual broad base terraces were built crosswise of these narrow plats. Outlets were provided in the channel above the terraces so that the run-off and eroded material could be collected and measured. The plats were clean cultivated and were kept in good tilth. Water was applied by means of sprinkling cans in a manner to simulate rainfall. In a few cases the run-off from natural rainfall was collected. This checked closely with the results obtained from the artificial applications.

RESULTS

The run-off from these plats with short terraces slightly exceeded the run-off from the plats having no terraces to obstruct the flow. The increase in run-off was about 1 to 3 per cent. over the unterraced land.

The amount of soil lost in the run-off water was increased on both sets of plats where the terraces were used. The soil washed down into the terrace channels was also collected and weighed. If this is added to the amount lost from the terrace outlets, the total amount is approximately 2.5 times as much as that lost from the unterraced land when plats 200 feet long were used.

The reasons for an increase in erosion on the terraced plats are that in the construction of terraces, the degree of slope on about one fourth of the land is decidedly increased. This increase in slope increases the erosion very greatly since the erosion loss is not directly proportional to the slope, but is much more rapid as the slope is increased appreciably above 6 or 8 per cent. The greatest increase in erosion on the terraced plat comes just above the terrace where the slope breaks off into the terrace channel. All the water from the land above the terrace moves over this portion where the slope has been greatly increased. Gullies start at this point and cut out very rapidly on account of the increased slope. The large losses of soil from the terraced plats therefore can be accounted for through the increase in the degree of slope over much of the land and because the steep slope above the terrace channel is subject not only to erosion from the water that falls on it but also to the water that runs down from above and still further increases the cutting of gullies.

A NEW TYPE OF TERRACE

In order to eliminate the effect of this increase in slope, a new type of terrace has been constructed and tested. In this type all the soil is moved up from the lower side of the terrace and there is no channel cut out above the terrace ridges, hence there is no increase in slope on the upper side of the terrace. A depression or broad trench is made on the downhill side of the terrace, where the soil is obtained for making the ridge. Water falling on the lower side of the terrace ridge is caught in this depression and is not lost from the field as run-off. This shortens by about 15 feet the distance over which water flows to the next terrace. Water running from the lower rim of this shallow channel down to the next terrace encounters no increased slope and since the distance is not great enough to allow much water to accumulate, little erosion takes place above the terrace. The water above the terrace is allowed to spread out in a broad belt, thus increasing the opportunity for absorption. This is particularly the case with land of less than about 6 per cent. slope.

The results of the determinations to date show that the losses from this type of terrace have been decidedly less than from unterraced land. Direct comparisons on adjoining plats of the two types of terraces illustrated in Fig. 1 have shown that the amount of water lost from the terrace built from the upper side exceeded that from the new type terrace by 2 to 5 per cent. of the total water applied. The soil lost was 3 to 6 times as much as that lost from the new type terrace. With the terraces built from the lower side there was little tendency to start gullies above the terraces except in the case of exceptionally heavy applications of water. In all cases gullying was much more severe in the case of terraces having a channel cut on the upper side. The differences were so great as to leave little doubt as to the advantages of the new type terrace (B).

Further tests are needed to prove the practicability of this type of terrace in the field, but the results so far indicate for it a great superiority over the so-called Mangum or broad-base terrace that has been used so widely in the past.

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