

used. The fact that potash tends to delay maturity when applied in liberal amounts may have some bearing on this point. In these tests it was found that phosphates and potash did increase the amount of clover, but where nitrogen was applied in addition the grass was further stimulated and became a very strong competitor of the clover. Subsequently it may appear that, due to the greater growth of clover, the true grasses will grow more luxuriantly as has been observed elsewhere.

It is worth while remembering that other plants, such as lettuce, spinach and plants grown for their leafy tops are fertilized not only with nitrogen, but with large amounts of phosphates and potash also. With grass, we have been trying to keep it growing in many cases by the use of nitrogen alone. Some greenkeepers have found already that they can well afford to apply some complete fertilizer to greens, even during the summer if applied in very small quantities along with the compost that is usually put on. Of course, this has to be done with care, but where greens seem to be lacking vigor and tone undoubtedly fertilizer carrying phosphates and potash will be of much benefit.

Advise Early Application.

Where complete fertilizers are applied it seems from all evidence obtainable at present that it should be applied very early in the growing season, as soon as grass shows signs of renewed growth in the spring. The test conducted by The National Fertilizer association, referred to above, showed that where the top-dressing was made early that there was twice as much grass produced as where it was applied 30 to 50 days later. The early application of top-dressing means more vigorous and better turf earlier in the season and a very much better established grass during the late summer. Golf courses that formerly applied fertilizers in the usual manner—after the grass is well established—have found upon changing methods and applying the fertilizer very early that they have received a much more permanent growth of grass.

Much of our knowledge of growing grass is empirical. What we need is some definite experimental work to establish the factors most favorable to growing grass under the very artificial conditions now obtaining on greens and even on fairways. Some of the lines of work that might be undertaken are a study of the root system development as effected by the repeated cutting. Does frequent cutting weaken or tend to strengthen the root system? Does the heavy watering during the summer keep the feeding roots near the surface or does it cause them to go down? These factors have a definite relation to the permanency of the turf. Further, a histological study of the cell structure of grass should be made under various fertilizer treatments. Do repeated applications of nitrogen weaken or strengthen the cell wall? This information is of value in determining the relation of fertilizer treatment to resistance to disease and attacks of brown-patch.

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