Tests for Deficiency of Phosphorus in Colorado Soils

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The semiarid prairie soils found on the eastern slope of Colorado constitute the types of soil used most extensively in the greenhouses of this state. These soils have an average of from eight to sixteen inches of precipitation annually. Thus they have not been subjected to excessive leaching and weathering. In general, these soils range from slightly acid to highly alkaline; they are low in organic matter and often show a deficiency of available phosphorus. Because soil is plentiful and cheap, the practice of changing soil in the benches every year is still followed almost exclusively.

The foregoing statements describe the existing conditions and also bring attention to the problem of phosphate testing.

Disadvantages.

The general principle employed in most quick soil-testing kits for the determination of phosphorus is the reduction of dithionite or sodium molybdate with stannous chloride or stannous oxalate. This method has several disadvantages. First, the resulting color is not stable. Second, precautions are taken to eliminate the effect of arsenic, silicate or iron compounds which may be present in the soil extract. Third, the tests must be made in about one minute, since, upon standing, the soil reagent will develop a definite blue color when tested separately. Fourth, it is necessary to make up a fresh solution of stannous chloride or stannous oxalate each time a phosphate test is made. The size of the crystalline material used may affect the color obtained. The method, however, has the distinct advantage in that it is highly sensitive to small quantities of phosphorus pentoxide and it is rapid because the solution need not be heated.

The necessity of being certain that the blue color obtained in the phosphate test is due to phosphorus alone cannot be overemphasized. A grower testing his own soil and consistently obtaining high phosphate readings will naturally refrain from applying phosphorus in his fertilizer program. If the blue color which he is reading in his test is not due to the presence of phosphorus, then he may be depriving the plants of the element they need. Thus a phosphate test giving a stable color which need not be read immediately and which would eliminate possible interference of arsenic, silicate and iron compounds is greatly to be desired. Such a test can be obtained by Zinzadze's drop method for the detection of phosphorus as outlined in Industrial and Engineering Chemistry, Vol. 7, No. 4, July 15, 1935.

Zinzadze's method employs a molybdenum trioxide solution partially reduced to the molybdenum blue reagent. Upon the addition of this reagent to a measured amount of soil extract, the blue color disappears, but, upon heating to boiling, it reappears in four to five minutes as a measure of phosphorus pentoxide in the soil extract.

With Blue Reagent.

The procedure employed here was developed for the soil extracting method advocated by C. H. Spurway, of the Michigan agricultural experiment station, East Lansing.

A half teaspoon of soil (level full) is placed in a tube graduated at 15 cc. One drop of thirty per cent acetic acid is added and shaken for one minute. The solution is filtered and the extract tested for phosphorus as follows: To one cc. of the extract placed in a small flat-bottomed tube add one drop of normal sulphuric acid and one drop of eight per cent sodium bisulphite (NaHSO3). Shake and boil gently for one-half minute over an open flame. Then add four drops of molybdenum blue reagent and heat to boiling in a water bath. Permit the tubes containing the soil extract to remain in the boiling water bath for a few minutes. Cool the tubes and allow them to cool for about twenty minutes before reading.

Heat Necessary.

The solution need not be heated to boiling after the addition of normal sulphuric acid and eight per cent sodium bisulphite if no great amounts of arsenic, silicates or iron are present. If, upon cooling, you observe the color to fade slightly, it will be necessary to heat the tubes before adding the molybdenum blue reagent. The fading may be due to a high nitrate content in the extract. In the presence of nitrates, the sulphuric acid can change the nitrate to nitric acid, which, in turn, oxidizes the phosphomolybdate, causing the blue color to fade. The addition of normal sulphuric acid and eight per cent sodium bisulphite, followed by gentle boiling for one-half minute, will greatly eliminate the effects of the nitric acid.

A screen stage one-half inch high placed in the bottom of a 250 cc. beaker, filled about one-third full of water, will serve satisfactorily as a water bath. A 250 cc. beaker is just large enough to prevent the small flat-bottomed tubes, furnished in the Simplex soil-testing kit, from falling over. The purpose of the screen stage is to keep the tubes from bumping. A small gasoline blow torch, which will be satisfactory for heating the water bath, can be procured at almost any chemical supply house and other places for a small cost. The necessity of heating is not a drawback to the greenhouse operator testing his own soil. He is working inside on a bench and can easily provide some means of heating the solutions if necessary.

Finally, the colors obtained are compared with standard color solutions. In cooperation with J. W. Tobieson, of the chemistry section of the Colorado experiment station, a phosphorus solution of Known concentration was diluted and tested by the method outlined in the foregoing. It was found that the known solution was diluted to 3, 1, 1/2 and 1/4 part per million, was identical with the per acre readings on the phosphorus chart in the Universal soil-testing system by M. D. B. Carter. Reading from top to bottom, these corresponding values are 300 lbs.; 3 ppm; 200 lbs.; 2; 100 lbs.; 1 ppm; 50 lbs.; ½ ppm; 25 lbs.; ¼ ppm. The colors of this chart have thus been adapted to the molybdenum blue phosphorus test as developed by Zinzadze.

The molybdenum blue colorimetric test for phosphorus has several advantages. The color obtained is stable and the effect of arsenic, silicates, iron and nitrate are largely eliminated. The color need not be read immediately. Thus a series of tests may be run at one time. Also there is no necessity of making up a fresh solution of stannous oxalate each time a phosphate test is to be made.

The method has one disadvantage in that the unknowns being tested must be heated to boiling in order to obtain rapid development of color. This, however, as mentioned before, is not serious.

The correct interpretation of a phosphorus test after it is obtained is just as important as the actual obtaining of the test. Several factors may interfere with the phosphorus test resulting in the development of a blue color which is not indicative of the phosphorus present in the extract. As stated previously, Colorado greenhouse soils are generally deficient in phosphorus. Therefore, the grower testing his own soil must be sure that the blue color obtained is due to the phosphorus in the extract minus the interference of other factors. The test method as outlined, though not strictly quantitative, provides a fairly accurate estimate of available phosphorus in Colorado soils.
OMAHA SCHOOL PLANS.

Members of the committees in charge of the spring F. T. D. school of design to be held at the Hotel Castle, Omaha, Neb., March 16 and 17, met in Omaha February 18 to complete their plans for one of the largest schools held in that section of the country for some time. George M. Johnston, Beatrice, is expected to attend, as well as many other prominent florists of that area, including Chester L. Brown, Webster City, Ia., and Arthur Smith, Boone, Ia.

The school will open at 9 a.m. Wednesday, March 16, and will continue throughout the day until 4 p.m., with an intermission for lunch. The same schedule will be followed on the second day. The ballroom on the second floor of the Hotel Castle is being used for the school, since it has a stage at the front. The hotel has recently been renovated and newly furnished, and rooms may be had at $1.50 to $2 for a single and $2.50 to $4 for a double.

Wednesday evening a banquet for members and guests will be held at the Hotel Paxton, Fourteenth and Parnum streets, at $1.50 per plate. Entertainment will be provided, as well as an orchestra for dancing after the banquet.

Nationally known artists who will be in attendance are George M. Johnston, Mitchell; Inez Williams, Columbus, O.; H. Hokin, St. Paul, Minn., and B. Hubbard, Chicago. Many local artists will also take part. Registration is restricted to F. T. D. members and their employees.

Committee chairmen have been selected from the F. T. D. units sponsoring the school. They include R. W. Whorley, Mason City, Ia.; Carl Gehre-cke, Creston, Ia.; J. S. Wilson, Des Moines, Ia.; Chester L. Brown, Webster City, Ia.; Tangle Top, Hastings, Neb.; Frank Darling, Norfolk, Neb.; Mrs. George Suris, Omaha, Neb.; Robert Daniels, Lincoln, Neb., and George M. Johnston, Beatrice, Neb. Much effort and thought are being put into the arrangements made by the committee, and since the school comes just a month prior to Easter, those attending will have the opportunity to see the newest floral designs for Easter, as well as to acquaint themselves with the latest Zorn & Gaertner greenhouses with the president, Michael Zorn, and other officers and trustees of the club, to plan in detail this silver anniversary celebration and make it the outstanding event in the history of the club.

Albert G. Boehringer, Seeley.

READING FLORISTS' BANQUET.

Twenty-five years of activity will be climaxed by the Reading Florists' Association this Saturday, with a silver jubilee banquet at the Berkshire hotel, Reading, Pa. The dinner is scheduled to start at 7:30 p.m. with an invocation by the Reverend Charles E. Roth, Wilbert N. Abel, president of the association, will deliver a welcoming address. The toastmaster will be Stanley Giles.

The guests of honor who will attend are Henry Stump, mayor of Reading, and his wife. Charles H. Grakelov, Philadelphia, will give a short address, and the Reverend Roth will also speak. After the banquette, entertainment and dancing are scheduled.

J. Frederick Frank is general chairman of the affair. He is assisted by the following committee chairmen: invitations, Wilbert N. Abel; tickets and reservations, Francis M. Bander; orchestra and entertainment, Otto Heck; publicity, Amos Mattern; decorations, Harry F. Heck; program, Wilbert N. Abel; ladies' reception, Mrs. Amos Mattern; and cards, Mrs. Ferdinand Heck. Programs which bear a short history of the organization will be given out. Harry F. Heck is in charge of the historic write-up.

MARYLAND SHORT COURSE.

The second annual short course at the University of Maryland, College Park, Md., will be held in March 7 and 8. The committee in charge is calling on those in Baltimore and Washington who helped to make it such an outstanding success last year to cooperate again 100 per cent.

Monday, March 7, is growers' day, and Prof. A. S. Thurston, of the university faculty, has arranged a fine program. His speakers will bring information which no grower of flowers can afford to miss.

Carl J. Carnes, Woodstown, N.J., will represent Arno H. Nehrling, president of the Society of American Florists, and tell about the advertising plan for growers. Dr. Richard F. White, heard with interest several years ago, now the Washington representative of the American Association of Nurserymen, will bring a message of cooperation vital to each one. William Dieckmann will talk on the growing of indoor crops. Francis Ruzicka, Chatham, N.J., vice-president of Roses, Inc., will tell of rose production methods and also speak on the necessity of a growers' national organization. Gustav H. Fosch, Ohio State University, will tell of the latest methods in floriculture. Frank E. Cremer, Hanover, Pa., will speak on miscellaneous greenhouse crops, as he did at Cornell University recently.

The market, March 8, is retailers' day. The style show will be of particular interest portraying, as it will, costumes and flower arrangements from the stone age up to the present. Maurice Cushing, one of the Guild trustees, will cooperate with the committee in planning details. Hutzler Bros. Co. will again furnish costumes, and Helen Marie Finger and Nancy Bowyer, and Mrs. Amelia Gude Thomas, Washington, D.C., will provide the models with appropriate corsages.

S. S. H.

CINCINNATI, O.

The Market.

Business transacted for St. Valentine's day this year surpasses the expectations of everyone. No one had anticipated a great amount of business, and consequently all florists were caught unprepared to demand. Fortunately for the retailers the market was heavily stocked with everything desired for the day, and no orders had to be turned down. The heavy demand was fortunate, also, for the growers, for stock of all kinds had accumulated on the market, and a heavy loss would have been suffered.

After February 14, business dropped off to nearly nothing, causing the market to break the closing days of the month.

Prices on flowers, including even roses, were shorted to tempt the few buyers who came in to select one or two small items. Roses were down to $4 for a hundred and were in abundance. For the first time in weeks, every size of rose was available in any quantity desired. Easter lilies, also, crowded the market to such an extent that they could be bought up as low as $3 per hundred, a price almost unheard of at this time of the year.

Other stock in profusion included snapdragons, sweet peas, stocks, gladiolus, daffodils and tulips. Postscript narcissus were seen more frequently, while delphinium, from the south, was a novelty to the list. Gardenias were sold in large numbers for the holiday, as were phalaenopsis and violets. Cattleya orchids, however, were on the short side.

Azaleas sold in large numbers, although a quantity of them, which arrived late, was left over. Tulips, daffodils and hyacinths were in good demand.

Various Notes.

William Toedt, of the Virginia Flower Shop, had the misfortune to be rounding the curve of the Marshall avenue hill one day last week just as another driver coming in the opposite direction, decided to use the entire street in making the turn. To prevent a serious collision, Mr. Toedt swerved his new Pontiac so that it crashed against the car considerably in going into a ditch. Just another case where justice dealt the blow to the wrong person.

Charles L. Brown, Cincinnati's younger growers, has made rapid strides with his new business on Baltimore road. Knowing little of the flower business when he began, he has progressed sufficiently to add another greenhouse to his range, and also a fireproof workshop and a 4-car garage. The construction of these will begin soon.

Everett Walt also is having green-