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Ferns and Fertilizer

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Horticultural knowledge concerning the fertilization requirements of ferns is far greater than the literature indicates. Experienced fern growers have known for a long time that proper fertilization of ferns enhances their growth and beauty. Equally well known is the fact that ferns suffer readily from improper fertilization. Considering these two points, the complex reactions between plants and soil, and the reports of individual gardeners, the result is a confused potpourri of advice. Much of what is written by individual gardeners is solid, practical advice, but many times it is applicable only to a particular fertilizer or soil mix, pattern of watering, quality of the water, or other specialized condition. There is a need for trained personnel to ascertain through controlled studies more precisely the response of ferns to mineral needs. This information would be of great interest not only to the horticulturists, but also to ecologists and others who deal with ferns as experimental material. The diversity of fern habitats, which ranges from tree tops to rocks to heavy clay soils, opens up a whole field of possible investigations on soil and mineral studies. However, this paper is written with the needs of the amateur fern grower in mind, and concerns some of the basic practices and principles in providing minerals to ferns through fertilization.

WHICH FERNS NEED FERTILIZATION?—All the cultivated ferns known to me benefit from proper fertilization by growing faster, larger, or both. Ferns do differ in their responses. As a whole, ferns require less fertilization than most cultivated seed plants.

WHAT HAPPENS IF FERNS ARE OVER-FERTILIZED?—Stunting, yellowing, and, more commonly, burning or browning of the foliage, wilting of the fronds due to root damage, and in severe cases death of the plant may occur. These reactions are primarily due to too much soluble salt from the fertilizer collecting on or near the plant tissue and indirectly damaging the tissue by dehydrating it.

WHAT ARE THE CONSEQUENCES OF NO FERTILIZER?—If the soil is of good quality and other conditions are favorable, ferns may not need fertilizers, and growth is usually steady and adequate. Less favorable conditions may result in stunting, slow growth, poor quality foliage, and susceptibility to disease.

WHAT KIND OF FERTILIZER SHOULD BE USED?—The amateur should use fertilizers that have a reputation for low burn. These fertilizers are available in forms to be applied as liquids or dry. Liquid types include fish emulsion (5-2-2), "Blue Whale" (6-2-1). "Orchid Spoonit" (30-10-10), "Hyponex" (7-6-19), and others. Forms applied as a powder or in granules include fish meal (9-3-0), cottonseed meal (6.4-1.5-1), "Milorganite" (6-3-0), hoof and horn (15-0-0), and others. The first of the three numbers listed after each fertilizer indicates the percentage of nitrogen (N), the second number the percentage of phosphorus (P), and the third the percentage of potassium (K). The percentage varies from brand to brand, but is always given on the label. Fertilizers having all three of these important mineral elements are termed complete fertilizers, as opposed to incomplete fertilizers, which lack one or more elements. Complete fertilizers are generally preferred over incomplete ones, but results vary from grower to grower, depending on the soil and cultural practices.

HOW SHOULD FERTILIZERS BE APPLIED?—Certainly the manufacturer's directions should be followed carefully. If you are uncertain about a fern's tolerance to fertilizer, there is no harm in reducing the fertilizer concentration to half. Fertilizers to be dissolved in water should be thoroughly dissolved before application. Fertilizers applied as a powder or granules should be sprinkled thinly and evenly over the moist soil surface, and the plants

watered thoroughly *immediately* after application. Any fertilizer inadvertently spilled on the foliage should also be washed off immediately. If too much fertilizer is applied in one spot, especially on or near the crown of the fern, remove as much of the fertilizer as possible and water thoroughly. Not only will this reduce the possibility of burning the fern but will also reduce concentrations of mold growth. Fertilizers derived from organic substances may encourage microorganisms. Although such fertilizers must be decomposed by microorganisms before releasing most of their nutrients, very high concentrations of mold may be damaging to the fern crown and young fronds. Where warmth and high humidity occur, as in greenhouses, molds and bacteria may become particularly troublesome, especially with very young ferns. Under these conditions manures in particular should be avoided. Note that with ferns the surface of the soil should not be disturbed by tilling at any time. Fern roots are fine, fibrous, and close to the surface. Tilling the soil to mix in the fertilizer may easily damage the roots. This means that even with a thin even application and adequate watering, some of the fertilizer may remain on the soil surface. This should not be of consequence, as long as it is of the low burn or no burn type and is not concentrated in one spot. In time these particles will dissolve and reach the roots. Liquid applications have an advantage in that most of the fertilizer salts are dissolved before application and are promptly carried to the roots. However, any solution passing beyond the root zone is lost to the plant. Liquid fertilizers leave less residue in the soil than dry ones do. This is a disadvantage because more frequent fertilization is needed with liquid types. On the other hand, liquid fertilizer may be applied at the time of watering, which saves considerable labor.

HOW FREQUENTLY SHOULD FERNS BE FERTILIZED?—Manufacturers usually have their own recommendations. On the average, one application about every three weeks for liquid forms and at longer intervals for dry application is sufficient. Ferns which do not enter any noticeable rest period, but continue to grow actively the year around, benefit from fertilizers the year around. Ferns

which are inclined toward a rest period or dormancy should not be fertilized during this time, as there is little intake of nutrients during periods of inactivity. When not fertilizing, less water is applied, which is beneficial because many tender species of ferns growing in marginal low temperatures are particularly sensitive to overwatering during periods of inactive growth. In very porous soils or under heavy and frequent watering leaching causes a great loss of fertilizer from the soil. On the other hand, soils which do not drain readily retain more fertilizer and need not be fertilized so frequently.

WHAT CAN BE DONE FOR WILTED OR SCORCHED FRONDS?—This kind of damage is difficult to correct with young ferns and those lacking large fleshy rhizomes. As soon as there is any indication of wilting or burning, remove all fertilizer that might be on the surface, see that the plant is well drained, and then water copiously to leach any remaining fertilizer out of the root region. After this liberal watering, water only sparingly so that the soil is aerated and not waterlogged, which will help to reduce the growth of decay organisms on the damaged root hairs and smaller roots. Also increase the humidity of the air and remove badly burned or wilted foliage. Recovery of the plant usually depends on the remaining undamaged roots or rhizomes which may send out new root branches and root hairs. Ferns with large fleshy rhizomes recover more easily because much food and water is stored in the rhizome.

WHAT ELEMENTS DO FERNS SEEM TO NEED MOST?—Nitrogen is the element most needed by plants. It is usually taken into the plant in the form of nitrates, which are very soluble and leach readily from the soil. Plants which have abundant nitrogen respond by producing large, soft, dark green fronds, which though attractive to some gardeners, are not firm and may appear coarse in habit. They are also more easily damaged by wind or during watering. Fewer fertile fronds are also produced. Potassium deficiency is rare, but has been reported for maidenhair ferns (*Adiantum*). The fronds are said to turn an abnormal reddish-brown color. A specific treatment is to apply potassium sulfate at

the rate of 1 teaspoon per 9 by 4 inch container. However, using a complete fertilizer should correct and prevent this problem. Trace elements and fern needs are not known precisely. Chelated iron compounds often added to fertilizers are reported to improve color and growth of the Holly fern (*Cyrtomium falcatum*). There are usually enough impurities in fertilizers to take care of the trace element needs of ferns.

WHAT IS SALT INJURY?—In areas of low rainfall the water supply may contain salts which retard plant growth or cause an unsatisfactory soil structure. If these salts accumulate in the soil around roots, stunted growth, scorching of the fronds, and wilting may occur. A white crust of salt may be evident on the surface of the soil or flower pot. In many of the western states it is important to have soil mixes which drain well and thus aid in leaching out the undesirable salts. Thorough watering leaches the soil better than frequent, light watering. Fertilizers containing sodium (e.g., sodium nitrate) should not be used if salt injury is a problem. Additional information may be found in the chapter "Irrigation Water and Saline and Alkali Soils" in the Yearbook of Agriculture (1955), published by the U.S. Department of Agriculture.

Because there are so many physiological, chemical, and physical factors entering into the relationship between growth and fertilization, it is impossible to cover every facet and discuss many of the exceptions. If proper fertilization does not bring about any improvement in a declining plant, one certainly should look for other common causes of poor growth, such as under- or overwatering, poor drainage and aeration, low temperatures, low humidity, inadequate light, and salt accumulation.

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