Ethnobotanical Leaflets

Inclusive Herbaria

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TEXT ONLY (from Indian Journal of Genetics & Plant Breeding 11(1): 1-3)

IN the earliest days of Systematics more attention was paid to cultivated plants and weeds than to wild species. The great herbals of the sixteenth century were largely given over to field and garden crops and everyday weeds. Until well after the time of Linnaeus, taxonomists included both cultivated plants and wild species in their botanical gardens, in their herbaria and in their writings. Only by slow degrees was there general recognition that the methods which are so effective for the bulk of the world's flora do not yield results of comparable efficiency when applied to cultivated plants and weeds. This perception came into being so gradually, that taxonomy as a whole drifted into its present position without any one taxonomist being aware of the drift and with only a few lone workers (Oakes Ames, L. H. Bailey, O. Stapf, D. Chatterjee) attempting to fight against the current. We now find ourselves in an anomalous position. Ninety-nine per cent of taxonomic effort is devoted to the plants least interesting and least important to man. Surely matters are out of balance when in many of the world's great herbaria there is not a single taxonomist who is devoting himself to the classification of cultivated plants and when the taxonomy of many of the world's most important genera (Phaseolus, Coffea, Brassica, Cinchona, Hevea, etc.) is so imperfect as to be of little practical use.

The gradual decision of orthodox taxonomists to avoid the classification of cultivated plants wherever possible was originally sound. Wild species could efficiently be understood by their methods; cultigens could not. Since the development of the so-called "New Systematics" such avoidance is no longer necessary. The special methods of this modern development in taxonomy are as useful in working out the complicated interrelationships of cultivated plants as they are in determining the course of evolution in natural populations. While it is usually assumed that the New Systematics derived its newness from the introduction of such techniques as cytology and pedigree culture from the experimental sciences, it would be more accurate to ascribe the change to new attitudes. The old taxonomy was satisfied if it discriminated between species; the new, desired to illuminate them as well. It wanted to know not only to which pigeonhole each entity belonged, but what kind of an entity it was. Was it diploid or polyploid, or did it include both diploid and polyploid races? Was it partially or wholly apomictic? Did it include

many highly differentiated local races of no nomenclatorial significance but of great biological interest? The New Systematics in other words interested itself in forces as much as in forms and in populations as well as in individuals.

The development of these techniques and attitudes makes it possible for us now to approach the classification of cultivated plants with some prospect of success. Relatively simple modifications and additions to previous herbarium techniques can produce an herbarium record which is efficient even with our most difficult cultivated plants. The resulting specimens resemble orthodox herbarium specimens in that they are mounted on the same size sheets and are stored in the same kind of steel or wooden cases. In other ways they are more like a loose leaf note book than herbarium specimen. They are different enough in purpose and in appearance that it may be well to christen them with a name of their own, and designate a collection of such specimens as AN INCLUSIVE HERBARIUM.

The inclusive herbarium has a more difficult job to perform than the ordinary herbanum. Therefore a more complete record of the plant is required. Knowing exactly what to include for the most efficient record of any particular cultigen is in itself something of a research problem; only by considerable experience with a crop plant or a weed can one determine exactly which features are most useful in working out its taxonomic relationships. One may summarize the necessary information under two heads (1) As complete a record of the plant as can be obtained, using pressed fragments, notes (morphological, ethnological, cytological), charts, and photographs to scale. (2) Information not only about the individual but of the population from which it came and the population to which it gives rise. This is essential either for cross-pollinated crops or for heterogenous native varieties of self-pollinated crops.

Two guiding principles need to be stressed. (1) Compactness is essential. A record of a single plant should not occupy more than one herbarium sheet if possible. Combinations of photographs and fragments will do a better job and take less space than a complete herbarium specimen. With Zea Mays, for instance, it has been found that while a pressed specimen of the entire male infloresence is useful, that a photograph, to scale, of such an inflorescence plus the pressed central spike and lowest secondary branch plus a simple diagram of the numbers and positions of branches at each node takes less space and is more useful. (2) Accuracy is more important than appearance. Provided field notes are legible it is better to mount the original notes directly on the sheet than to run the risk of having them altered during the copying process. For the same reason the name and number of each plant or plant portion which is photographed is taken directly on the photograph so that there need be no chance of mixing negatives or prints. If the material to be photographed is of any size, a permanent background is efficient. It should be set up in a well-lighted place but out of direct sunlight since strong shadows destroy the accuracy of the pictures. A set of deheaded nails down the middle of the board are useful in holding plants in position while the photograph is being taken. The background is painted flat white with black lines (horizontal or vertical or both) at regular intervals. Though it has to be renewed at frequent inter vals, adhesive lantern slide tape is convenient in making the black lines on the white background. Numerals giving the year are affixed to one side of the board and removable stencilled letters (heavy black on white cards) give the name and number of each culture which is photographed.

The exact record to be made will vary with every crop and with the extent to which its most salient variables have been determined by previous study. After ten years' work with maize the following optimum record (see Plate I) may be recommended. (1) A photograph of an entire plant taken against a scaled background and a similar but more enlarged photograph of the tassel (male inflorescence). (2) An internode diagram showing the lengths of successive internodes and the number of developed and undeveloped ears (Anderson and Schregardus 1944). (3) The sheath and lower blade of the leaf below the ear, slit in half longitudinally and pressed. (4) The central spike and the lowest secondary branch from the main tassel. (5) A sample of the kernels from which the plant was raised. (6) Notes as to silk and anther colour and plant colour. (7) Notes as to the numbers and positions of the knobs on the pachytene chromosomes. (8) Notes and statistics as to the variation of sibling plants. (9) Diagram of the tassel node by node, showing the number of secondary branches at each node and their relative positions. For making a record of field samples of a mature crop of maize see, Anderson, 1947.

For Phaseolus, the following schedule has been worked out. (1) Pressed specimens of an average leaf, an inflorescence, and a mature seed pod. (2) Samples of the mature seeds. (3) Notes describing flower colour in the keel, wings and standard of the flower. (4) Notes and measurements as to the extent the cotyledons remain above or below ground after germination. (5) A photograph of an entire mature plant showing its branching habit.

An inclusive herbarium, carefully assembled, is of wide usefulness. Since it makes an accurate record of the plants most closely associated with man, the results obtained from studying the collection may be of significance for the study of man as well for the study of his economic plants. Frequently they will be found to yield precise data for such diverse disciplines as plant breeding, ethnology, prehistory, anthropology, ethnobotany or archaeology.

References

Anderson, E. and Schregardus, D. (1944). A method for recording and analysing variations of internode pattern. Ann. Mo. bot. Gdn., 34: 241-47.

Anderson, E. (1947). Field studies of Guatemalan maize. Ann. Mo. bot Gdn., 34: 433-67.

EXPLANATION OF PLATE [see original article]

Photograph showing a typical sheet from an inclusive maize herbarium. Upper left, male inflorescence photographed against a scaled background, below it the ear from which this plant and its siblings were grown. Upper centre, entire plant photographed against a scaled background. (All three of these photographs have the name, number and dates of the culture photographed on the negatives but it has been trimmed off in mounting). Upper right, diagram showing arrangement, node by node of the secondary branches of the male inflorescence. Center of sheet, lowermost secondary branch and central spike of male inflorescence mounted on the sheet. Lower left, notes and measurements on the 14 siblings from which the photographed plant was selected. These are stapled to the sheet (staples shown

as two lines at the base). Behind these notes can be seen the upper portion of an internode diagram of the above plant. Center below, notes as to pachytene knobs, etc. and B chromosomes, written directly on the sheet.

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