absorption properties of leaf with minimum scattering contribution. In order to minimize the scattering contribution due to air spaces in the mesophyll, water logged leaf was used in the measurement.

The Figure shows the attenuation spectrum (Cheng et al., SPIE Proceedings, vol. 4262) of maize leaf. Note the high attenuation in UV as the result of proteins and other organic compounds. The attenuation in the blue and red spectral region is the result of chlorophylls and other photosynthetic pigments. The attenuation in the IR range (>1400nm) is mainly due to the presence of water in the leaf tissue. The translucent window of maize leaf suitable for light microscopy is within the spectral range of 350-1400nm.

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Tom Thumb, a useful popcorn

--Bass, HW, Kang, LC, Eyzaguirre, A

We have been working with an extra-early yellow popcorn for several years and report here on some of the desirable attributes of this variety called Tom Thumb. Tom Thumb can be propagated by self or open pollination and appears to be a stable inbred. We have adopted Tom Thumb as one of our regular "'lab rats" because of its 1) extremely rapid life cycle, 2) tolerance to greenhouse growth throughout the year in Tallahassee, 3) uniformity of growth habit, and 4) good seed set as shown in Figure 1. The seed are available from the Maize Stock Center, but we routinely work with seed purchased from Johnny's Selected Seeds (johnnyseeds.com, Albion ME). As stated in their 2001 home garden catalog entry on Tom Thumb, "85 days, extra-early, yellow popcorn. Refined from a genuine New Hampshire heirloom by the late Prof. E. M. Meader, University of New Hampshire and Johnny's Selected Seeds. Matures even in the Far North. The plants are dwarf, only 3 1/2' tall, and bear 1 or 2 ears 3-4" long." We counted the leaf bearing nodes for plants (n=43) from the Fall 2000 greenhouse. Node number ranged from 8 to 11 with a mean of 10.

The plants are almost too quick and small for summer fields. They can be grown indoors in small pots at high density with relatively little supplemental lighting. The plants usually produce tillers that can be cut back to assist shoot capping on the main stalk. Tom Thumb offers a number of advantages as an experimental or educational line of maize. For instance, a seed mutagenesis experiment can produce dominant mutations (plant or seed) during a single academic quarter or semester. Also, Tom Thumb might be good for production of transgenic maize using genotype-independent protocols.

We are currently breeding meiotic mutations into the Tom Thumb background for use in our work on meiotic telomere functions. We have examined the pollen mother cells and found them to be suitable for FISH and immunocytochemical analysis of meiotic prophase. Figure 2 shows that telomeres and several knobs can be detected by 3D FISH carried out as previously described (Bass et al., J. Cell Biol., 137:5-18).

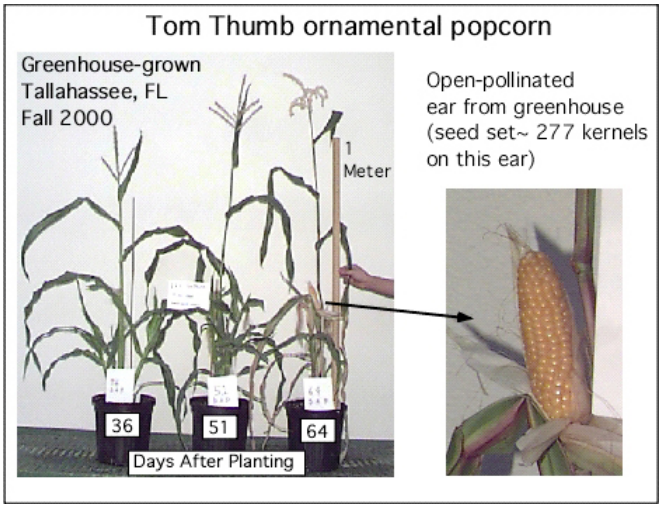

Figure 1.

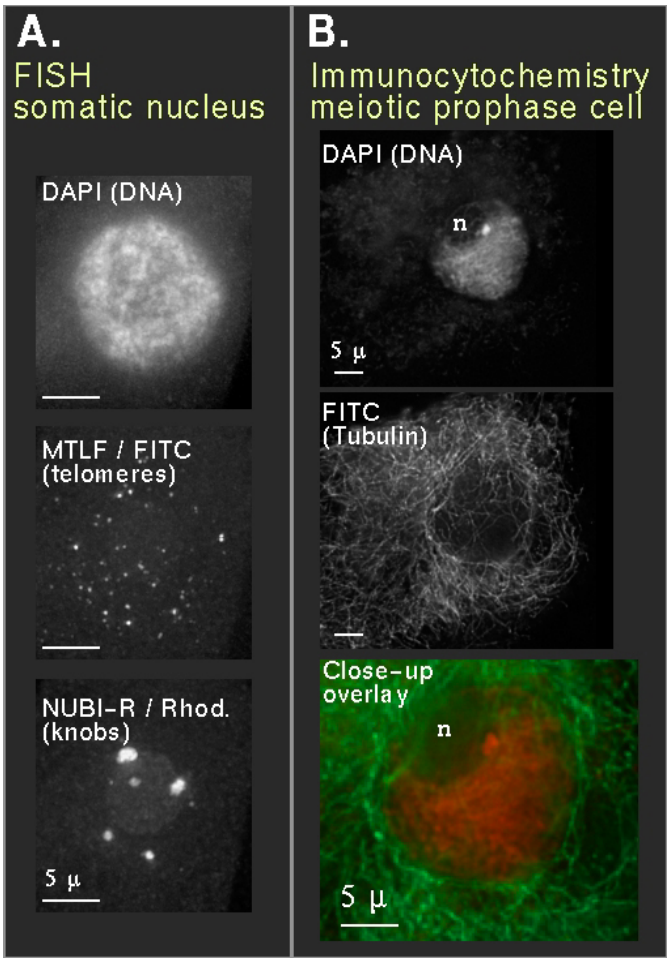

Figure 2.

We are collecting size-staged anthers of green-house grown Tom Thumb plants. The size classes are "A" < 0.5 mm; "B" 0.5-1.5 mm; "C" 1.5-2.5 mm; and "D" 2.5-3.5 mm. Figure 3 shows DAPI images of representative meiotic nuclei from A, B, and C size classes which contain anthers from premeiotic interphase plus early leptotene, leptotene plus zygotene, and zygotene plus

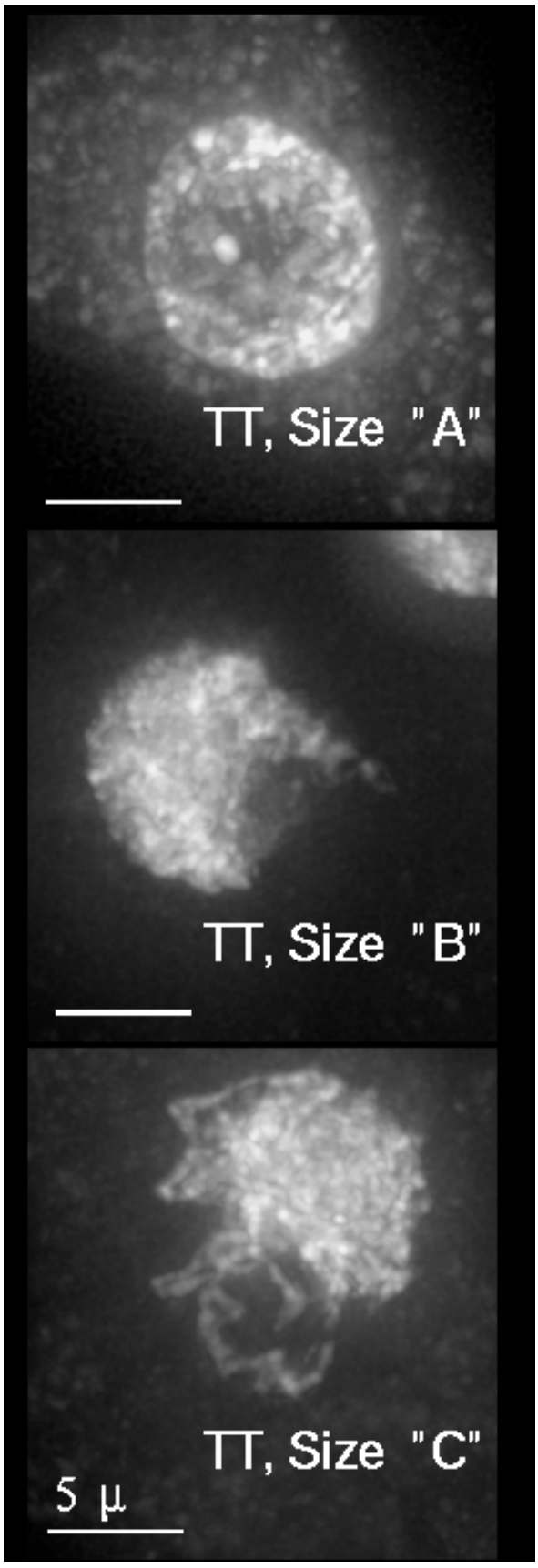

Figure 3.

pachytene, respectively. These anthers will provide mRNA preparations for microarray analysis of meiotic gene expression. Anthers from the larger floret are dissected in the greenhouse, measured on a ruler under a dissecting microscope, and frozen. Anthers are collected for four months at a time, then a new set of collections is started. Those shown in Figure 3 are from the first trimester of 2000 (Jan-April).

Variable distribution of meiotic homologs; on-line spinning projections of 3D data from chromosome painting and telomere FISH analysis of OMAd9.2

--Bass, HW, Bordoli, SJ

We have developed a 3D FISH system to study meiotic telomere behavior and homologous chromosome interactions during meiotic prophase (Bass et al., 1997, J. Cell Biol., 137:5-18). In a recent chromosome painting study, the 3D intranuclear distribution of homologs was characterized in pollen mother cells before and during meiotic prophase (Bass et al., 2000 J. Cell Sci. 113:1033-1042). Examination of deconvolution image data revealed a surprising diversity of homolog arrangements and dispositions, relative to each other, and relative to the position of the telomere cluster-defined bouquet. In particular, many bouquet-stage nuclei (mostly at zygotene) contained spatially separated homologs. This observation, along with the published measurements of interhomolog distances in well-preserved nuclei indicate that premeiotic pairing does not contribute much, if anything, to the zygotene synapsis that is required for proper homolog disjunction. Thus, the homology search appears to function during meiotic prophase, after chromosomes have reorganized into condensed and extended fibers, and largely coincident with the bouquet stage when the telomeres are clustered on the nuclear envelope.

Computer-assisted inspection of the 3D data conveys a great deal of information. In order to make the visual data more accessible, we have prepared an on-line supplemental data page for some of the meiotic nuclei analyzed by Bass et al., (2000). The web page, http://bio.fsu.edu/~bass/mv/bq2/, contains a table with links to Quicktime movies that can be downloaded or viewed with web browsers. For each movie, projections of the FISH signals are shown for the telomeres (purple) and the maize-9 homologs (green). The DAPI image, which marks the entire nucleus (42 oat plus 2 maize chromosomes), was omitted. Each movie is made from a cropped down cube of data in which a single spherical nucleus is centered.

This form of data display may be useful to researchers and educators who are interested in the native structure of meiotic chromosomes and the function of the telomere bouquet. The movies convey some of the spatial and topological aspects of meiotic chromosome pairing and synapsis. The original data are archived as DeltaVision image data (A.P.I. Seattle, WA) and the optical sections can be distributed as grey scale TIFF files upon request from HWB (bass@bio.fsu.edu).