NAPPN Annual Conference Abstract: Competition for resources during semi-sequential growth of developmental units drive allometric patterns in the grass *Setaria*

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Resource allocation drives the above-ground distribution of mass in grass plants across discrete developmental units called phytomers. Although the number of phytomers varies in genetically-identical grasses, there frequently isn't an associated variance in some summary phenotypes. To understand what may be driving this, we tracked the growth of 30 *S. italica* plants from genotypes B100 and A10.1. We experimentally observed that plants from the genotype B100 had between 20 and 22 phytomers, while plants from the genotype A10.1 had between 7 and 9 phytomers. B100 plants with more phytomers (e.g., 22) did not grow taller or have more total leaf length, despite having more leaves than plants with fewer phytomers (e.g., 20). A10.1 plants with more phytomers (e.g., 9) did grow taller and had more total leaf length than those with fewer phytomers (e.g., 7). We developed a dynamical model to determine if these patterns are emergent from the underlying growth structure. The model is parameterized using the number of phytomers and related developmental time parameters: leaf emergence, stem and leaf elongation time, panicle emergence, and flowering time. The model uses the semi-sequential nature of phytomer growth as its structure. The model predicts that differences in timing of the shift to reproductive growth could explain the patterns observed. Experimental measurements suggest this shift is primarily due to tuning the developmental time parameter controlling the units contributing to the stem, rather than leaves.