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Co-ordination between primordium formation and leaf appearance in soybean (*Glycine max)* as influenced by temperature

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Soybean production is expanding into cooler and warmer environments. Temperature influence on nodal leaf appearance rate and nodal primordium formation rate – two critical parameters that determine potential leaf area, light absorption, and crop growth and yield – is poorly understood. This study aimed to determine the influence of temperature on primordium formation and leaf appearance and to investigate how the co-ordination between these two processes is affected by contrasting temperature regimes. The experiments were conducted in field and greenhouse settings using indeterminate cultivars differing in maturity group. Soil and air temperature was measured at 30-min intervals, starting at sowing until physiological maturity. Plants were dissected every 4–7d to determine the number of primordia at the stem apical meristem and to estimate primordium formation rate. The number of nodal leaves at main stem was assessed periodically to estimate rate of leaf appearance. Primordium formation ended near the beginning of pod setting, while leaf appearance ceased at the beginning of seed filling. The end-season finale number of primordia was greater than the final leaf number, revealing a surplus of primordia that did not advance beyond primordial stage. Across experiments, mean temperature during the phases of primordium formation and leaf appearance ranged from 15 to 26°C. Both primordium formation and leaf appearance were temperature-dependent, but primordium formation was faster than leaf appearance. The plastochron was 36°Cd, whereas the phyllochron was biphasic, decreasing from 83°Cd to 58°Cd during ontogeny. A strong relationship was found between the number of primordia and the number of leaves, which was stable across experiments, treatments, and cultivars. This study has established that both primordium formation and leaf appearance in soybean are influenced by temperature, with a co-ordination between these two processes. The co-ordination model presented here can be used for robust prediction of seasonal nodal leaf dynamics in soybean.