Chapter

Yield Components and Biomass Partition in Soybean: Climate Change Vision

Milton E. Pereira-Flores and Flávio B. Justino

Abstract

Long-term climate change and inter-annual climate variability are events of concern to farmers and humanity. Global warming could affect agriculture in various ways and it is anticipated that agricultural systems will face great pressure from the variability of climate factors and their extreme events, which in most cases are difficult to predict, particularly extreme events of rainfall, higher dry season, hot and cold waves and their interactions. Global warming could also have some positive effects for plants such as increasing the temperature of current cold regions and increasing carbon dioxide with its positive effect on photosynthesis, growth rates, the use of water and production. Meanwhile, there are still many questions that remain about this possible future. This chapter, brings the response of plants to future conditions through specifics alterations in its components of yield on environmental conditions with enrichment of CO_2 and elevated temperature, two climatic factors, which is understood to be the factors of climatic change of greater global extent. The study of the components of yield and their alterations, can guide diverse sectors of the sciences and decision makers, in order to structure strategies of resilience in the cultivation of soybean.

Keywords: yield components, soybean, global climate change, elevated CO_2 and temperatures, production

1. Introduction

Global climate models predict increases in air temperature by up to 2–4°C, CO_2 concentrations higher than 700 $mmol.mol^{-1}$ and increase in ground O_3 higher than 70 ppb by the end of the year 2100 [1, 2].

Based on these projections about the changes in the growth environment of the cultivated plants, it will be prudent to know how the current cultivars can be affected in their yield components, which are what define the productive potential.

Despite the existence of many studies simulating future scenarios made in FACE (Free-CO_2 environmental), OTC (open top chamber) and Growth Chambers to know how the altered climate factors will affect the physiology and production of soybean, few studies have been directed to understand those alterations in the level of the yield components that are the intrinsic factors of the plant more sensitive to climate change, and that also depend on the management of the crop at the field level. This anticipated knowledge may be important for the direction of policies and research lines in various areas of agricultural sciences to develop diverse resilience strategies to climate change.

The understanding of how climate influences the growth, development and production of soybean plants depends on the understanding of how the yield components respond to the variations of climate factors, which can also be elucidated if studies the plant alterations in the future atmosphere conditions. The plant production is determined by changes in yield components, in last instance. The artificial enrichment of the growth environment of soybean plants with CO_2, O_3 and temperatures according to the forecasts on the atmospheric composition for the year 2100, can allow to know the morphophysiological responses in several levels of the plant organization, long before environmental changes occur.

The study of the morphophysiological mechanisms of response of soybean plants to the ecological environment where they develop and produce grains, constitutes the basis of soybean ecophysiology.

The factors of the climate (temperature, radiation, rainfall, wind and atmospheric pressure, among others), plus the physicochemical properties of the soil and the cultural practices applied in the field continuously influence the performance of the community of soya plants from germination to the senescence of the plants. Throughout the different phenological stages, the expression of stage-tissue genes defines the course of the development of the plant, the formation of the biomass and its components (roots, stems, leaves, flowers, fruits and seeds) respond simultaneously and hierarchically with the objective of completing its biological cycle and producing seeds for the perpetuation of the plant, and that for humanity represents the basis of agricultural production.

The most important climatic factors for the development and production of soybean cultivars are temperature and photoperiod and their interactions, plus other favorable/limiting factors and resources such as precipitation variability, appropriate supply of nutrients and elimination of inter- and intraspecific competition, which also interact to determine the production of soybeans in a given region [3, 4].

The temperature is directly related to the speed of the metabolic rates and the chronological duration of the different phenological stages of the crop, and in the case of floral induction, in interaction with the photoperiod in plants responsive to the duration of the night to flower. The photothermal influence in the growth stages can be predicted by unit heats method. In general, the temperature determines the growth rates and the duration, in days, of each stage of the development phases. Soybeans have cardinal temperatures for most of their developmental stages [5, 6].

According to the American Society of Meteorology, cardinal temperatures correspond to the minimum (Tb) and maximum (TB) temperatures that define the limits of growth and development of an organism and an optimal temperature (Top) in which growth proceeds more rapidly (htpp://glossary.ametsoc.org/wiki/Cardinal_temperatures). According to the above, the rate of development increases linearly between Tb and Top; decreases from Top to TB, and after TB the development stops and the duration of the phase becomes infinite. It is possible to specify that Top, is not a thermal point, but the average of a very narrow range of temperatures, where the majority of the enzymatic reactions that participate in the growth is close to their catalytic maximums.

The soybean cardinal temperatures defined several plant processes from temperature thresholds. The lower base temperature (Tb) vary between 6 and 10°C to plant development. The lower thermal thresholds are: (Tb) of 10°C [7], 11°C [8], and 14°C [9].

The germination rate is close to zero at 15°C and maximum at 25°C [10]. Other thermal threshold to highest growth was found between 29 and 31°C [11, 12], thermal threshold that is the same to maxima protein content in the grains [13].

For photosynthesis, optimum diurnal temperatures are between 30 and 35°C, and for growth, night temperatures between 21 and 27°C. Temperatures less than 22°C delay the retention of pods and at temperatures ≤14°C flower abortion may occur [14]. Temperatures close to or above 40°C have negative effects on growth rate and pod retention [15].

In general, vegetative and reproductive growth in soybean can reach high rates in temperatures between 25°C and 30°C during the growth season, because the maximal vegetative and reproductive development occur in 30°C and 25-29°C, respectively. In addition the optimal floral anthesis temperature is achieved in 26°C [16, 17]. Thus, the choice of the time of year considering the regime of soil and air temperatures are determinant to establish the best sowing times, in which the thermal supply of the soil-atmosphere system is satisfactory, together with the adequate availability of water to meet the consumptive use of the crop. In fact, soybean yield components are negatively correlated with temperature increase and these components are temperature-dependent [18, 19], mainly, when the temperatures on field exceed the optimum temperatures [20, 21].

The main effect of the photoperiod is to induce flowering after the juvenile phase is over. Low temperatures and long days delayed the flowering time, and consequently, the anthesis and the maturation time [22, 23]. This relation is widely known, as well as, that the greater sensitivity to photoperiod and low temperatures are more obvious among the genotypes with greater sensitivity to the photoperiod; late maturation cultivars are more sensitive than early cultivars [24]. Most of the soybean cultivars have a pre-inductive or short juvenile stage, and floral induction may occur at any stage after the development of the first unifoliate leaves [25]. With the incorporation of long juvenile periods, soybeans currently produce soybeans until the 15th degree of Latitude, preventing the early induction of flowering [26].

The variation of flowering time between soybean cultivars, from a genetic point of view is very complex, because it will probably not be so easy to identify the molecular bases of the major genes and Quantitative Trait Loci (QTLs) underlying the natural variation in flowering time of soybean, because most of those genes and QTLs exist in multiple copies in the genome, interacting more or less with one another and with the environments in which the genes are evaluated [27]. In the specific case of soybean, some cultivars must fulfill a juvenile stage before the influence of the photoperiod for the induction of flowering, and the sensitivity can occur from the expansion of the first V1-V2 vegetative stages (first and second trifoliate leaf) [28]. From then on, the taxa of growth and development of the plants will be a function of the availability of light, water, nutrients, and above all, of the temperature up to values close to the optimal Day/Night temperature. In turn, after flowering induction plus higher temperatures the duration of this inductive stage can be varied and influence the size and characteristics of the canopy, that is, the height of plants, the number and length of productive branches, effective leaf area and number of flowers per cluster, among others.

Rainfall is the most common form of water supply, and its intensity and variability are pointed out as determinants of the risk to the success of production in most soy producing regions in Brazil, EUA and China [29]. Precipitations between 450 and 800 mm may allow high yields depending on distribution throughout the cultivar cycle and on edaphic and climatic conditions [30]. However, this high yield potential is soil type and climate dependent, mainly of the interaction with temperature, evapotranspiration, and soil water content. The interannual variability of those climatic factors provoked by the climatic changes are characterized by the occurrence of extreme events of excess and precipitation deficit and heat waves in relation to the normal climatological is great determinant of the soybean yield [31, 32]. The occurrence of prolonged "veranicos" (absence of rainfall for 25 continuous days or more during the summer) has been more frequent and prolonged, for example, in December and February in the central region of Brazil and pointed as the most dangerous condition for the success of soybean plantations.

2. Yield and yield components

2.1 Yield production

The increase in soybean production under high [CO_2] has been variable, ranging from increases of about 17%, marginal increases [33, 34], and no gain in production [35]. In most cases the increases have been derived mainly from gains in the total weight of grains at harvest, the increase in the number of pods [36] and the average weight of the grains [34, 37].

In understanding the magnitude of differences in production gains over high CO_2 concentrations, we should consider aspects such as the type of cultivar, production system and densities used, and the interaction with the climatic factors of each region where the plantations occurred. For example, it was verified increases in biomass and seed weight in the day/night thermal regimes 20/15°C compared with elevated thermal day/night regime like 30/25°C under 700 ppm CO_2 [38]. In other similar study, a greater number of branches and productive nodes were formed in 26/20 than in 22/16°C [39]. In this case, the positive interaction between elevated [CO_2] and temperatures regimes, resulting in increases in production. Thus, it can be concluded that the closer to the temperature regime of the optimum temperature, positive interaction can be expected for greater production, than when the temperatures exceed the Top. However, the meta-analysis performed on the results of several studies on the productive response of soybeans to CO_2 increase shows that, despite increases in foliar absorption of CO_2, soybean production is less responsive in experimental conditions and that the responses in field conditions were smaller than those performed in confinement (pot use) [37] The question, again, goes back to the point of knowing how to explain this low response at plant level.

Recently, a study conducted with 18 soybean cultivars (II, III, IV soybean groups) conducted in several years repeated with 550 ppm of CO_2, found average responses of 22% increase in the aerial biomass and only 9% in the yield of the seed, when grown in the appropriate growing season, and average temperatures of the growing season varying between 20.7 and 23.3°C [40]. During 4 years of study, there was consistency from year to year among genotypes that were more and less sensitive to the elevation of [CO_2], suggesting heritability of the CO_2 response [40]. In addition, cultivars with the highest coefficient of partition to the seed in the current [CO_2] also had the highest partition coefficient in the high [CO_2] [40]. This suggests, the existence of a variation genetic in the response of soybean to a high level of [CO_2], which is necessary to obtaining cultivars of soybean that adapt to future conditions.

2.2 Yield component basis

The production of agricultural crops in any environment or cropping system is ultimately the result of the biomass produced and the magnitude of that partitioned biomass for the harvested organ, which is measured in terms of biomass parity by the harvest index (HI).

In simple terms, production is the result of the interaction between the genetic potential of a cultivar and the biotic and abiotic factors that reduce that genetic potential. At the field level, plants are continuously subjected to multiple interactions with favorable results during most of the productive cycle, due to the plant's ability to adapt quickly to variations in soil and climate conditions and to technological support through agricultural practices.

The soybean plant is organized on the main stem on which the lateral branches and internodes are formed where flower clusters are formed (**Figure 1**). The order of the branches and bunches on the main stem are listed according to their ontogenetic chronology.

During the soybean cultivation cycle, five ontogenetic stages are distinguished, which are important in the determination of yield, which are: (1) The formation of organs responsible for the fixation of CO_2 and the absorption of water and nutrients (leaves and roots). (2) The formation of potential harvest organs (pods racemes in lateral branch or main stem racemes). (3) The determination of the effective density of harvest organs (number of pods/raceme-plant). (4) The filling of the harvest organs (number of filling seeds/pod, weight seed/pod). (5) Loss of functionality of leaves and roots (vegetative organs senescence, mature seeds in the pods) [41].

These stages develop successively with a degree of mutual overlap that varies with the type of cultivar and the environmental conditions of growth [41–44].

Two components of production are essential in the determination of soybean production. The number of grains per plant and the weight of the grains. The number of grains per plant is more closely associated with yield and is the most sensitive to the influence of the environment. This depends on the morphogenesis of reproductive structures on top of which are formed as are branches and clusters of the main trunk [41, 45–47].

Ontogenetically, the number of flowers in soy largely exceeds the potential capacity for fixation, even under restrictive environmental conditions. The fixation of the grains depends on the fixation of the pods and this characteristic is very sensitive to the availability of resources, so any physiological stress during the fixation of the pods determines the levels of pod abortion, consequently of the grain potential [41, 45–47]. However, between flowering and fully developed pod (R4) or start grain filling (R5) there may be compensation between yield components, fewer pods compensate with an increase in the number of grains per pod and/or grain weight.

Thus, in studies on the plant effects of high concentrations of CO_2 and O_3 it will be important to define the density of plants in the experimental field that avoid

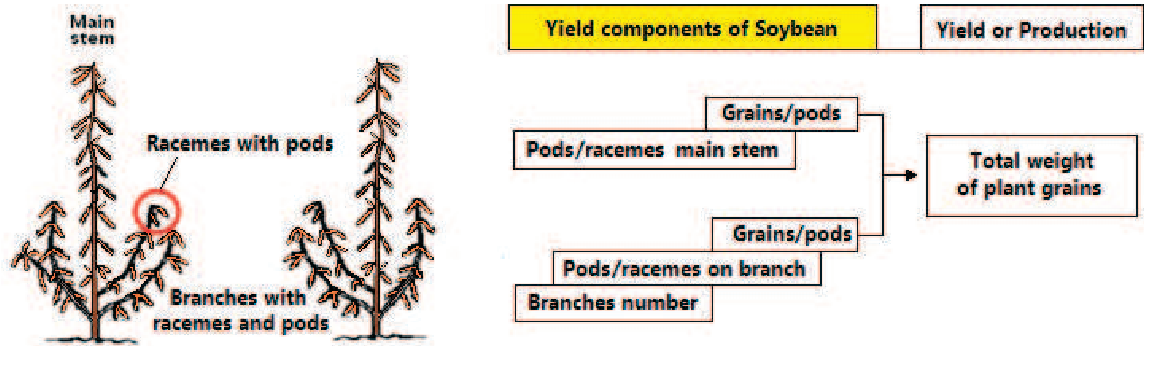

Figure 1.
Plant structure scheme with the branches and racemes contain pods, and the yield components in soybean which determine the production per plant.

high intraspecific competition during flowering and fixation of pods. An excessive competition for light can alter yield components such as number of branches and pods [34, 48, 49].

Adequate availability of light, temperature, water and nutrients during the period of performance determination, between the start of the pod formation (R3) and full green grain (R6) guarantees a high number of grains per plant [48, 50, 51, 52, 53]. It should be remembered that the plasticity in the number of grains per pod in soybeans is very low between 2.1–2.5 seed/pod [54, 55, 56], same with different cultural practices [57, 58, 59]. Thus, the number of grains per pod of soybeans can be less sensitive to stress compared to the number of pods.

The weight of grains, as the second component of the most sensitive yield, depends on the genotype and the environmental conditions that determine the photosynthesis capacity of the canopy, the translocation of assimilates, the duration of the filling stage and the competition between pods, and among grains on the same pod (source/sink ratio) [46].

The filling of the grain is strongly influenced by the availability and translocation of photoassimilates during the end of soybean development, before start of grain maturation (R7) [41]. Stresses by water deficit, thermal regime (below 25°C and above 35°C) can reduce the Leaf Area Index (LAI), thus like occurrence of rust and chronic exposures to O_3 can reduce the availability and use of photoassimilates by causing early senescence of the foliar area, and decreasing the photosynthesis and assimilated production [60, 61]. Thus, the benefits of the increase in CO_2 in the high photosynthesis and the more leaf area per plant can be decreased by foliar damage. Consequently, stresses during the start pod formation and the grain green full (stages R3-R6) affect the determination of the number of grains. Plant stresses between grain green full and start of grain maturation (stages R6–R7), decrease the weight of the grains on pods. On the other hand, a greater photosynthetic response in C3 plants such as soybeans to CO_2 increase, or high rates of photosynthesis among soybean cultivars, may not necessarily mean significant increases in production due to environmental interactions in the field, the possible effects of photosynthetic acclimatization, the increase of photorespiration by the increase in temperatures [62], and mainly by harvest index variability of soybean [63].

Climate changes, in particular, the increase in temperature and the concentrations of CO_2 and O_3 affect the development patterns and characteristics of the canopy as leaf area index (LAI) and internal structure of canopy [63, 64]. The magnitude of the alterations will be proportional to the environmental sensitivity of the cultivars and the applied productive management. Cultivars less sensitive to the indicated factors, the re-adaptation of population densities and arrangements in plant spacing may be the most immediate strategy such as resilience to climate change.

2.3 Changes in plant height, branches and racemes

Discussion on plant architecture is fundamental due to its link with the distribution of carbon allocation. Moreover, the understanding of plant shape allows for identification of plant features which are more strongly affected by environmental conditions such as CO_2 and weather parameters. Plants grown with higher CO_2 are taller than the plants in present conditions in the most several cultivars of soybean due to more nodes [34, 65, 66]. However, it is also possible to find no stimuli for the increase in the final height of the plant, which may be more likely in cultivars of certain growth habit [34]. Early results of [67] showed increase in height of the plant directly related with increase of more internodes and length of branches, or both.

The elevated temperature regime under CO_2 enrichment influences the growth and development of soybean plants. The temperature in plants, mainly affecting cell division, elongation rates, metabolic rates of photosynthesis and respiration in the daily cycle [68–71].

A mean temperature range of 29-31°C has been indicated as the optimum range for soybean vegetative growth [11, 12]. The main stem plastochron interval decreases and the final main stem node number increases in soybean with higher [CO_2] (660 μmolmol^{-1}) accompanied by a rise in mean temperature between 22.5 and 32.5°C [72]. Thus, the temperature increase can be favorable if closed to optimal temperature to soybean growth, even in conditions of greater availability of photoassimilates under higher concentrations of CO_2. Statistical analysis of correlation carried out by [34, 65] demonstrated a positive correlation between the plant height and the number of racemes, cultivar-dependent, under elevated CO_2 with 750 and 548 μmol.mol^{-1} and air temperatures, respectively. There was positive and significant increases in the number of nodes of soybean plant grown with elevated [CO_2]. It can be argued that the interaction between elevated [CO_2] and temperature in soybean influences the plant weight in two different ways, being through more number of internodes or internode length as also observed by [73] in 700 μmol.mol^{-1}. But depends on the on the cultivar response. It is important to note that changes in the plant height should induce modification in the configuration of other plant components, such as branches, pods and racemes.

The number of branches, racemes and total pods are the most important components for yield, and exhibit the highest correlation with the total yield [57, 74, 75]. A reduction by 18.5% in CO_2 enrichment in sensible cultivar to high CO_2 plant responses, and similar tendency happened in the number of pods/branch and grains/branch, with 35.1% and 35.2% decrease [34]. However, the number of grains/pods on branches can be remained unaltered in modern cultivars with small canopy or increase [66]. Based on previous studies one may anticipate that the increase of [CO_2] and warmer conditions may not contribute to the increasing yield due to reduction in the number of pods and grains on branches, if the current spacing and plant density remain unchanged. High yields were found with increased spacing under elevated CO_2 concentration [76]. In the evaluations of branch ontogeny or length of branches, the greatest branching plasticity of the US cultivars compared with Japanese cultivars should also be considered, together the inverse relation between the total length of branches and the density of plants [77].

The number of the racemes per plant and the number of pods or grains per racemes also respond to higher CO_2 depending on the cultivar. An increase in the number of the racemes/plant by 27% and 35% in grains/raceme in most sensitive of two cultivars, named Conquista [34]. In insensible modern cultivar (most ambient stability genotype) were not different in these characteristics. Additionally, there is a positive correlation between plant height and the number of racemes in sensible cultivar (Conquista) ($r = 0.67$; $P \leq 0.005$) [34].

A higher number of racemes lead to more pods and grains, which implies that a higher number of racemes in the main stem could partially compensate for the loss of pods and grains by the absence of lateral branches. The number of seeds per pod in soybean is very stable characteristic and can vary between 2.1 and 2.5 [54, 57, 58, 78] thus, the increase of the genetic plasticity of this characteristic can be a way for the increase of the productivity per unit of plant and area. Actually, this characteristic, perhaps, is the most limiting to increase the production in present and future environment.

The reduction in the number of branches observed in sensible cultivars under high competition among plants promoted by the higher CO_2 concentration can inhibit the axillary buds ontogeny in early vegetative stages [34, 55]. There is a need for further studies to elucidate the mechanisms of inhibition of branch ontogeny, and how early foliar self-shading can influence the ontogeny of branches and the number of its internodes.

According to the meta-analysis performed by [37], the increase of CO_2 in the growing environment results in a 35% increase in total dry matter/plant and the total leaf area/plant between 18 and 25% in soybean. This increase may result in larger dimensions of the canopy and the early occurrence of shading in the lower region of the canopy negatively affecting not only the ontogeny of the branches, but also the number of flowers and pods.

2.4 Changes in pods, grains and the grain weight

The pod sets, is the most variable yield component after the branch number. The integrated changes to plant level, such as total pods and grains per plant have been shown to cause the differences among plants under CO_2 enrichment.

The pod number per plant increases around 14% [37]. Previously, continuous and significant increases in the number of pods were found by [39] with increasing day/night thermal regime (18/12, 22/16 and 26/20°C) in interaction with each [CO_2] ranging from 350 (control), 650 and 1000 ppm of CO_2, respectively, in the cultivar Ransom cultivated under non-limiting conditions of water, nutrients and light inside a phytotron. Is evident the increase of the number of pod in all the racemes orders when the [CO_2] is near of 700 ppm [34, 67], however, the intensity of response is cultivar-dependent [34]. An evaluation about the relative partition of pods and grains per plant showed a greater relative partition of pods and grains in the first (basal) branches and in the first nodes of the branches and smaller relative partition in the subsequent branches and nodes [34].

In this way the gains in the first branches and nodes are lost logically by the reduction of pods and grains in the subsequent positions. Thus, a compensatory effect is established that cancels the initial gain, which may explain the small increase in production (7%) [34]. These authors, concluded that the ontogenic changes with respect to the formation of a smaller number of branches may be the cause of the low production gains under the effect of high [CO_2] due to the early self-shading.

Continuous shade between 60 and 90%, from initial bloom reduced pods per plant between 34 and 78%, respectively [79]. Several previous studies have found a reduction in the number of pods as the main factor of self-shading in soybean [80–82]. Additionally, [83] showed a greater sensitivity to shading of the number of pods per plant compared with the number of main stem nodes and the number of branches in two soybean cultivars grown with 50% of shading during soybean flowering. These authors [83] also verified increases in flower and pod abortion when the shading occurred together with lower temperatures, like 18°C day/10°C night.

The broader analysis of the grain weight in yield of the soybean points this characteristic to the low contribution to gain a significant increase in soybean production under conditions of high CO_2 concentration [37], despite having shown that the increase of the weight of the grains is possible in several cultivars [34, 65, 67].

Increases in the weight of grains have also been reported in soybean plants grown in an environment with elevated CO_2, independent of the changes in thermal regime even below the optimal growth temperature [38, 84]. There was strong fall in the seed weight in thermal regimens above the optimal temperature 32/22°C day/night, and increase by up to 13.5% in the grain weight in modern and landrace types when the temperatures during grown season closed to optimal temperature of soybean production [34, 46, 52, 85]. The increasing in weight of each grain is possible due to the existence of large genetic variability soybean species [86]. Besides the thermal regime influence, the long-term exposures of soybean plants to elevated [CO_2] can also change source-sink relations, and grain filling [76, 87].

The ratios of seed mass per plant, measured as seed mass obtained in elevated CO_2 compared the seed mass per plant in ambient (current CO_2 concentration), found by [34], was 1.13 for two contrast cultivars in canopy structure and size, modern (small canopy) and ancient (big canopy), and these ratios was coherent with the range from 0.93 to 1.87 previously reported by [84]. It has also been verified that higher [CO_2] and favorable temperature regime increase the grain weight through enhancements of sink-force of grains [34, 88]. However, the question remains whether this increase in sink-force is the same in all grains regardless of the position they occupy in the soybean plant. The variation in the number of pods and grains within their position in the branches and racemes helps explain how and where in the plant the changes occurred in relation to treatments. The number of grains per pod although it has lower variability has high heritability and greater positive effect on production [89].

2.5 Conclusions

The increase of [CO_2] in the soybean growing environment should lead to increases of among 7% [34] to 40% [37, 90, 91, 92, 93], and this maximum will depend on how the yield components are affected during growing season, which will depend on the cultivar, the density used and the interaction with temperatures close to the optimal temperature range for a particular cultivar. Temperatures that exceed the range of the optimal temperatures, cause negative alterations of the production of biomass and affect the partition for the formation of grains on the branches and clusters, reducing the yield. The elevated [CO_2] (around of 750 ppm) will attenuate the negative effects of the highest air temperatures because the carboxylase activity of Rubisco (photosynthetic enzyme of C3 plants) is favored by the higher internal concentration of CO_2 in the sub-stomatal chamber, resulting in photosynthetic rates higher than those obtained in the current CO_2 concentration.

The yield components most sensitive to the increase in atmospheric [CO_2] are the number of lateral branches, number of racemes in the main stem [34, 77, 79]. The number of pods formed will depend on the number on productive nodes formed on branches and in the main stem. Thus, plants adapted to future conditions should be able to maintain a high number of productive nodes per plant. The mechanisms of inhibition of the ontogeny of branches, mainly of the basal ones, still have to be explored, to define strategies of improvement, or management of densities between plants. The number and weight of the grains appear to be the most stable, which means that the increments of the production of soy may depend totally on the number of pods formed by the lateral branches.

Alteration in specific yield components and source-sink relationship is common in elevated CO_2, mainly in warmer climate at the level of branches, pods and grains. A better understanding of the response of soybean cultivars production, or for genotype screening, requires an evaluation of yield components, mainly in the branch level. Such is necessary to improve our understanding of sensible yield components in soybean genotypes and their ability to tolerate the impacts of the future climates.

Avoid intra-specific competition in future scenario by CO_2-increases, implies the need to avoid negative effects of intra-specific competition, such as self-shading [77, 79, 83], or the development of modern cultivars with narrow canopy and short branches. Thus, the current trend of the breeding soybean programs to decreasing the size of canopy [94, 95] as strategy to improve the productivity may continue to be the best strategy, even more so if plants were considered larger number of short branches to reduce the competition effect between the proximal and distant pods of the main stem as evidenced by [34].

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Conflict of interest

The authors declared that this chapter has no conflict of interest.

Author details

Milton E. Pereira-Flores and Flávio B. Justino*
Agricultural and Environmental Engineering Department DEA/UFV, Viçosa Federal University, Viçosa, MG, Brazil

*Address all correspondence to: fjustino@ufv.br

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