The fresh fruit bunch yield of oil palm of Chumpom Palm Oil Industry Public Company Limited, averaged during 1995-2003, ranged from 18.7-25.0 ton ha\(^{-1}\) under the same management. This study wants to acquire data on photosynthesis capacity of oil palm, with the above materials selected based on their yields, namely, 3 clones of high (Hi), medium (Me) and low (Lo) and one seed line from Costa Rica (Sd). The trees are 14 years old. Parameters obtained from leaflets of fronds 13 and 17 include chlorophyll content and SPAD index, PSII quantum efficiency, light response, CO\(_2\) compensation (\(\Gamma\)) and mesophyll conductance (\(g_m\)).

The chlorophyll content and SPAD index increase rapidly from the 1\(^{st}\) frond and reach the plateau in the 9\(^{th}\) frond. The maximum total chlorophyll content is 1.2 g m\(^{-2}\). The ratio of chlorophyll a:b varies from 2.64-3.99. The 25\(^{th}\) to 30\(^{th}\) fronds with the ratio of less than 3 indicate that the fronds are shaded by the canopy. The photosynthesis potential is evaluated using gas exchange measurement system with the leaf chamber maintained at 28C, RH 75-80% and air vapor pressure deficit (VPD\(_{air}\)) not over 1 kPa to maximize stomatal opening. The maximum quantum efficiency (\(\Phi_{dark}\)) is not different among the lines, being 0.80-0.83. Net photosynthesis rate is found to be limited by radiation of less than 1300 \(\mu\)mol PPF m\(^{-2}\) s\(^{-1}\).

Clone Hi has the best performance with the highest gross photosynthesis rate (\(P_m\)) of 20.3-22.5 \(\mu\)mol CO\(_2\) m\(^{-2}\) s\(^{-1}\), resulting from having the highest stomatal conductance (\(g_{s,max}\)) of 218 mmol H\(_2\)O m\(^{-2}\) s\(^{-1}\) and the highest rate of linear whole-chain electron transport (\(J_{max}\)) in the range of 158-189 \(\mu\)mol E m\(^{-2}\) s\(^{-1}\). The clone Lo has the lowest capacity with \(P_m\) of 13.3-18.7 \(\mu\)mol CO\(_2\) m\(^{-2}\) s\(^{-1}\), \(g_{s,max}\) 135 mmol H\(_2\)O m\(^{-2}\) s\(^{-1}\) and \(J_{max}\) 114-152 \(\mu\)mol E m\(^{-2}\) s\(^{-1}\). On the carboxylation process of oil palm, the \(\Gamma\) is in the range of 56-78 \(\mu\)mol CO\(_2\) mol\(^{-1}\) air and \(g_m\) 60-106 mmol CO\(_2\) m\(^{-2}\) s\(^{-1}\). All the parameters show that oil palm has a high assimilation rate in comparison with other fruit trees and the high photosynthesis capacity is one of the factors contributing to the corresponding high yield.