P045

# The Characterization of Different Types of Lignins from *Arabidopsis thaliana* L.

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## Objectives

Manipulation of gene expression in monolignol pathway is providing some advantages in terms of less cost and less pollution for pulp and paper industries. Therefore, the investigation on lignin is prerequisite for estimation of consumed cost and chemicals.

## Materials and Methods

o Plants of arabidopsis (*Arabidopsis thaliana* (L.) Heynh) as *fah1-2* (G-type lignin), C4H-F5H transgenic line (S-type lignin), and wild type (G+S type lignin) were grown in Chungnam National University green house facilities. All stems of arabidopsis used were separated, immediately placed in liquid nitrogen and stored at -80 ℃ until used.

o All samples were performed various chemical analyses such as alkaline nitrobenzene oxidation (NBO), thioacidolysis, lignin determination by acetyl bromide, and Mw. distribution.

## Results and Discussion

o It is well known that S type lignin is much higher yields and recovery of NBO and thioacidolysis products than G type lignin.It was confirmed by NBO and thioacidolysis again using milled arabidopsis lignin (MAL) samples (Table 1 and 2). The recoveries of total yields in both NBO and thioacidolysis were 25-28% for C4H-F5H, 22-24% for wild type, and 21-22% for *fah1-2*. The recovery % is in the order of C4H-F5H, wild type, and *fah1-2*, owing to the proportion of S units.

o The UV spectra shown in Fig. 1 are obviously different absorptivities among MAL samples. The absorptivity values are 17.77±0.23, 18.93±0.26, and 14.98±0.14 for wild type, *fah1-2*, and C4H-F5H respectively (Table 3).

o The wild type and *fah 1-2* showed a weak shoulder peak at Mw around 35000 and a peak at Mw around 4600. Whereas, C4H-F5H showed a relatively strong peak at Mw around 35000 and a peak around at Mw 1800. This result revealed that lignin consisted of G units has higher polymerized lignin than S-units of lignin in MAL samples.

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Table 1. Results of NBO in purified lignins from arabidopsis.

| (mg/g) | H | V | S | VA | SA | Total | S/V ratio |
|---|---|---|---|---|---|---|---|
| Wild type | 1.45±0.25 | 158.75±0.30 | 52.29±0.02 | 23.32±0.09 | 7.72±0.34 | 243.52±0.97 | 0.33 |
| *fah 1-2* | 1.40±0.11 | 188.31±2.65 | trace | 31.86±0.23 | trace | 221.56±2.32 | -[a] |
| C4H-F5H | 3.66±0.11 | 16.16±0.01 | 213.42±0.22 | 3.31±1.27 | 41.88±0.28 | 281.37±2.69 | 12.66 |

[a] Can not be calculated

Table 2. Results of thioacidolysis in purified lignins from arabidopsis.

| (mg/g) | G units | S units | Total yield | S/V ratio |
|---|---|---|---|---|
| Wild type | 184.40±1.27 | 34.55±0.07 | 218.95±1.20 | 0.19±0.00 |
| *fah 1-2* | 205.05±0.21 | trace | 205.05±0.21 | -[a] |
| C4H-F5H | 24.20±0.28 | 224.55±2.62 | 248.75±2.33 | 9.29±0.23 |

[a] Can not be calculated

Table 3. Absorptivity values of purified lignins from arabidopsis.

| ($g^{-1} l cm^{-1}$) | Absorptivity |
|---|---|
| Wild type | 17.77±0.23 |
| *fah 1-2* | 18.93±0.26 |
| C4H-F5H | 14.98±0.14 |

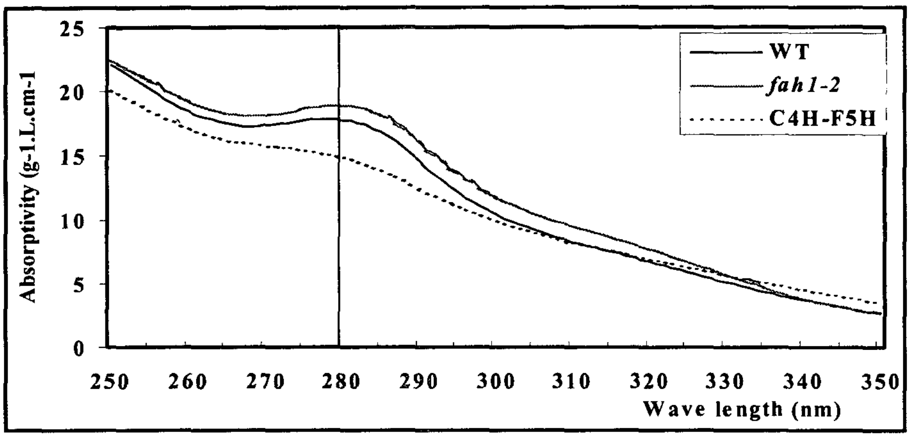


Fig. 1. Changes in the UV absoption spectra of different types of lignins.

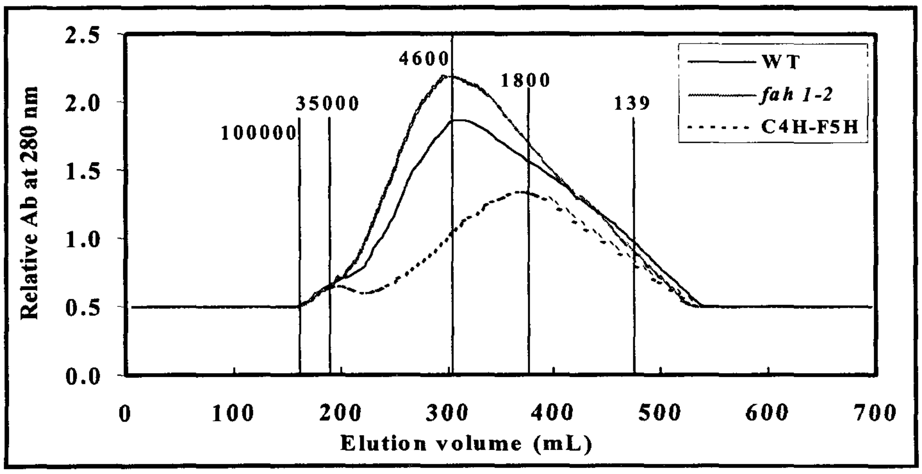


Fig. 2. Molucular weight distribution of different types of lignins.