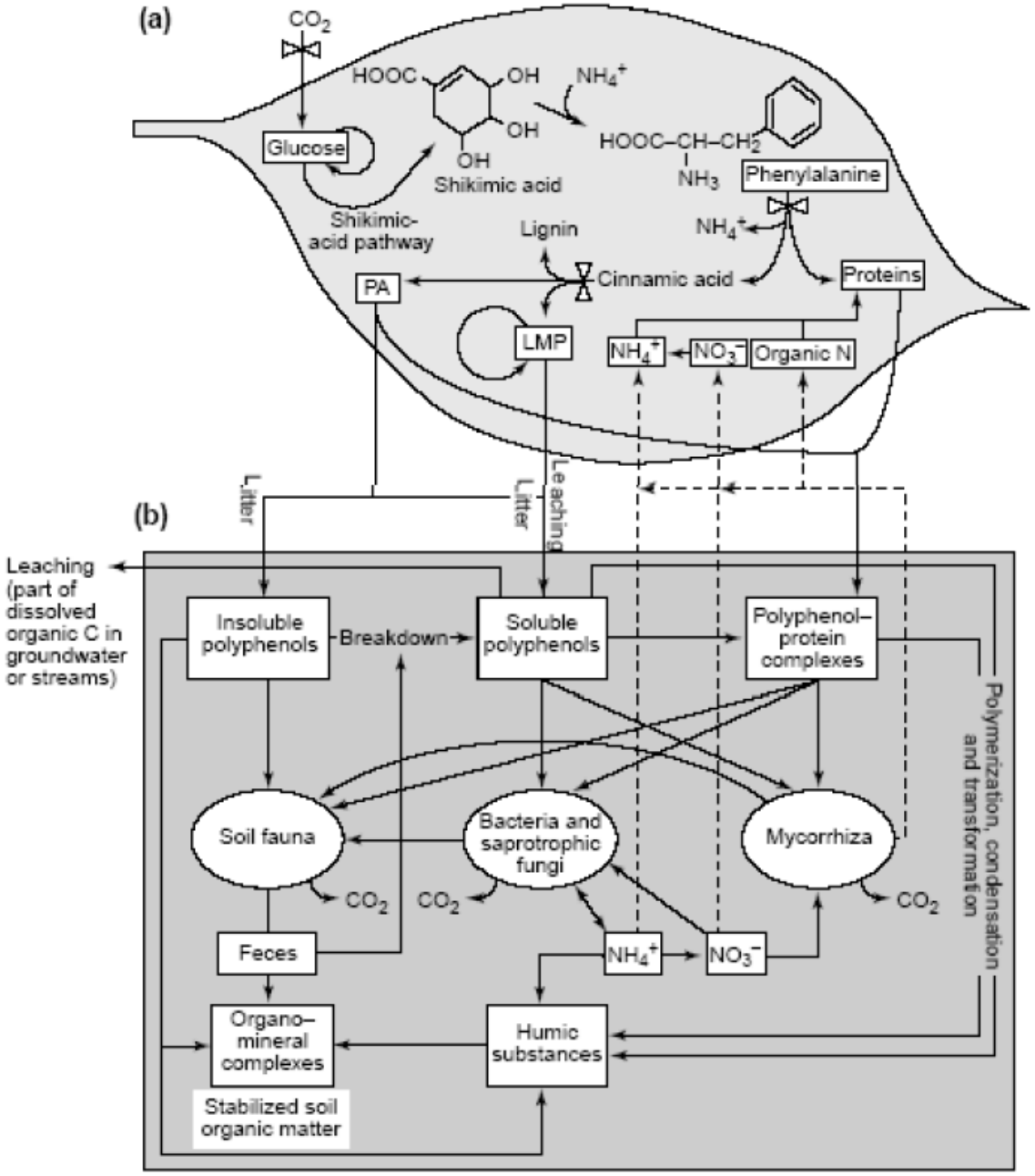
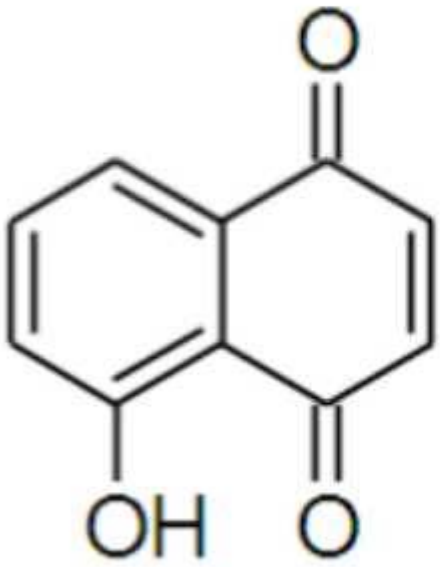
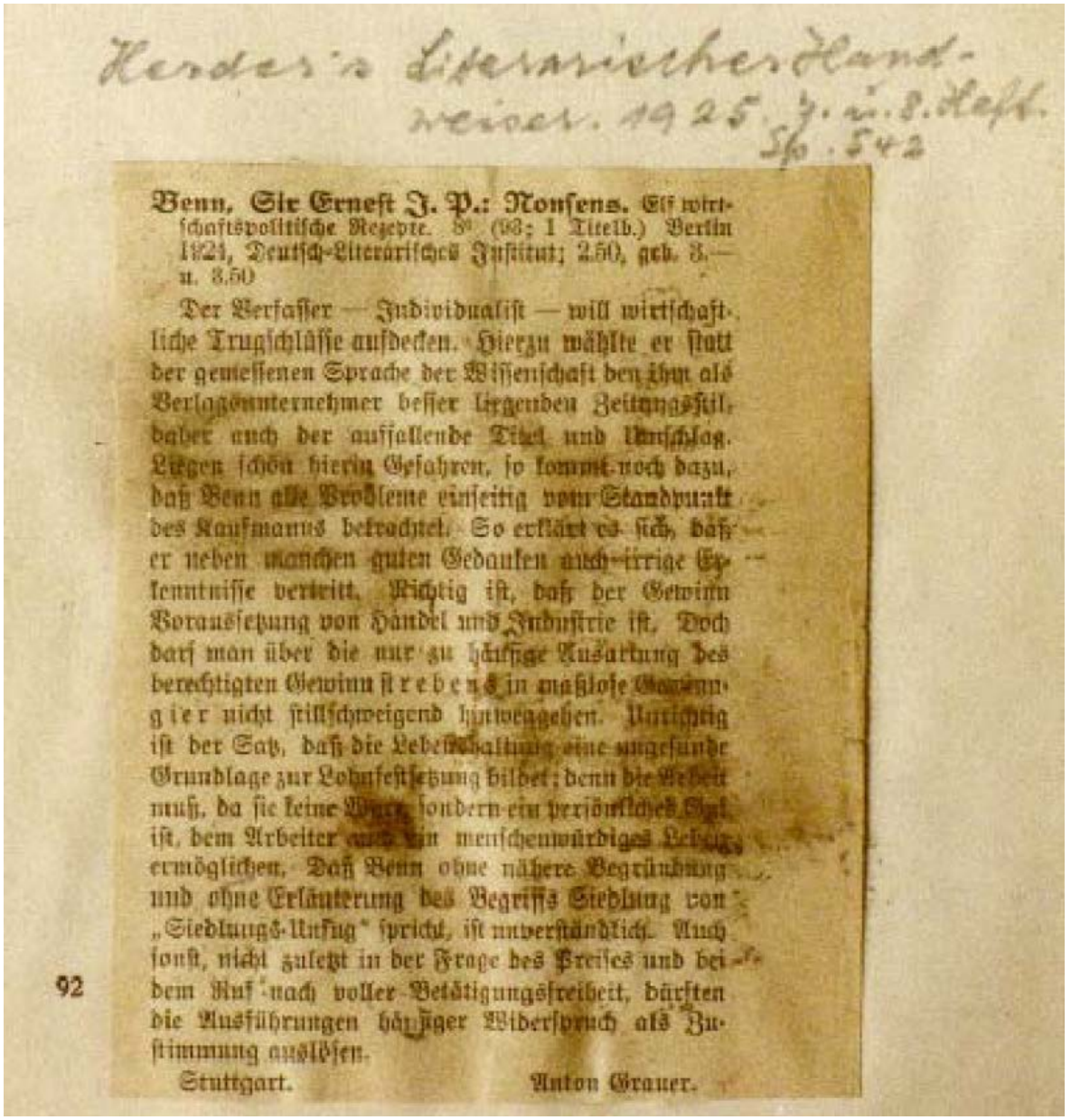

(a)
CO_2
HOOC
OH
OH
OH
Shikimic acid
NH_4^+
Glucose
Shikimic-
acid pathway
HOOC–CH–CH_2
NH_3
Phenylalanine
NH_4^+
Lignin
Cinnamic acid
Proteins
PA
LMP
NH_4^+
NO_3^-
Organic N
Litter
Litter
Leaching
(b)
Leaching
(part of
dissolved
organic C in
groundwater
or streams)
Insoluble
polyphenols
Breakdown
Soluble
polyphenols
Polyphenol–
protein
complexes
Polymerization, condensation
and transformation
Soil fauna
Bacteria and
saprotrophic
fungi
Mycorrhiza
CO_2
CO_2
CO_2
Feces
NH_4^+
NO_3^-
Organo–
mineral
complexes
Humic
substances
Stabilized soil
organic matter

Wallnut liquor



Juglon

Mould stains



Herder's Literarischer Handweiser. 1925. 7. u. 8. Heft. Sp. 542

Benn, Sir Ernest J. P.: Nonsens. Elf wirtschaftspolitische Rezepte. 8° (93; 1 Titelb.) Berlin 1924, Deutsch-Literarisches Institut; 2.50, geb. 3.— u. 3.50

Der Verfasser — Individualist — will wirtschaftliche Trugschlüsse aufdecken. Hierzu wählte er statt der gemessenen Sprache der Wissenschaft den ihm als Verlagsunternehmer besser liegenden Zeitungsstil, daher auch der auffallende Titel und Umschlag. Liegen schon hierin Gefahren, so kommt noch dazu, daß Benn alle Probleme einseitig vom Standpunkt des Kaufmanns betrachtet. So erklärt es sich, daß er neben manchen guten Gedanken auch irrige Erkenntnisse vertritt. Richtig ist, daß der Gewinn Voraussetzung von Handel und Industrie ist. Doch darf man über die nur zu häufige Ausartung des berechtigten Gewinnstrebens in maßlose Gewinngier nicht stillschweigend hinweggehen. Unrichtig ist der Satz, daß die Lebenshaltung eine ungesunde Grundlage zur Lohnfestsetzung bildet; denn die Arbeit muß, da sie keine Ware, sondern ein persönliches Gut ist, dem Arbeiter auch ein menschenwürdiges Leben ermöglichen. Daß Benn ohne nähere Begründung und ohne Erläuterung des Begriffs Siedlung von „Siedlungs-Unfug" spricht, ist unverständlich. Auch sonst, nicht zuletzt in der Frage des Preises und bei dem Ruf nach voller Betätigungsfreiheit, dürften die Ausführungen häufiger Widerspruch als Zustimmung auslösen.

Stuttgart. Anton Grauer.

92

Brown-rot fungi

Quinone redox cycling depends on iron

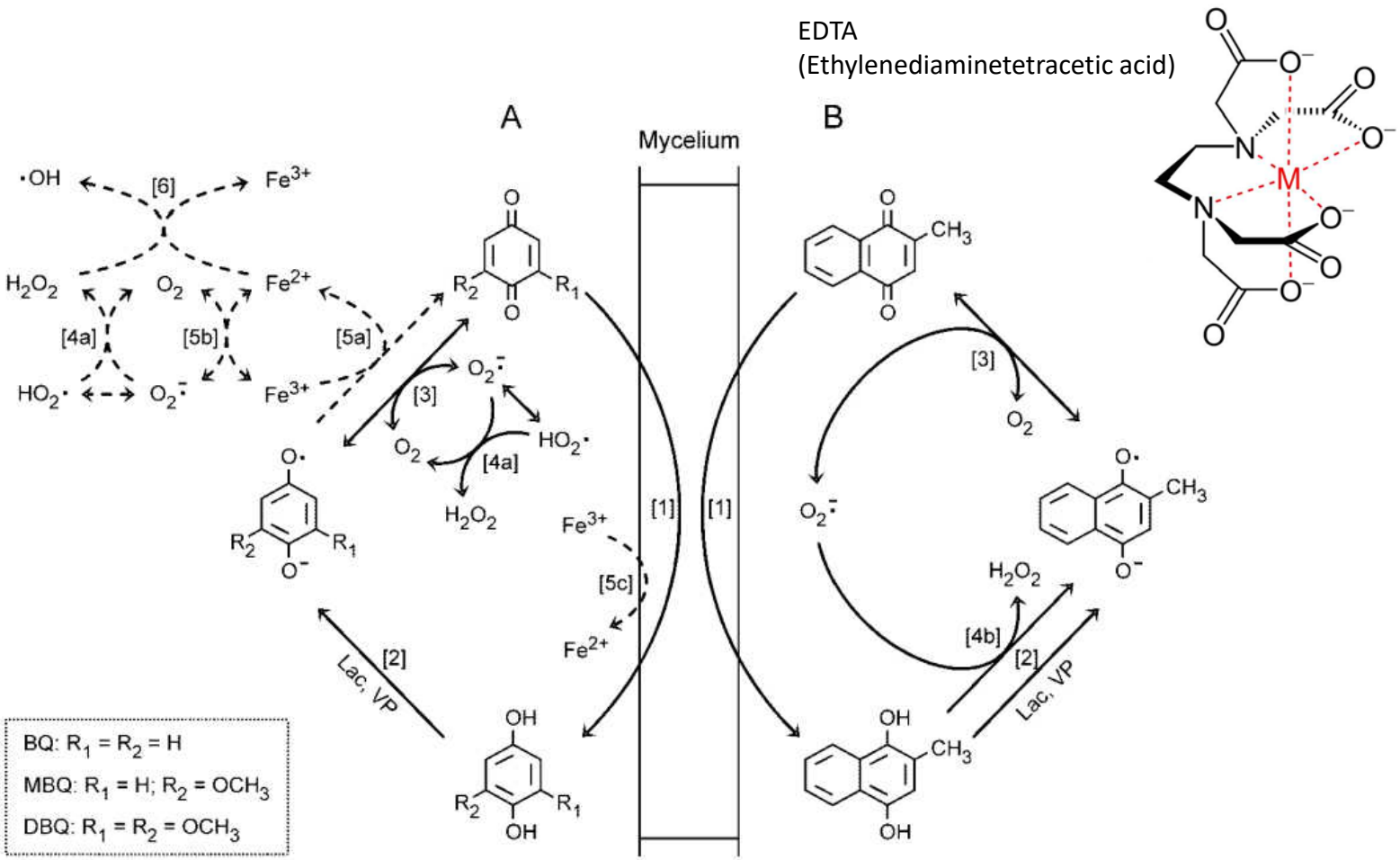


FIG. 8. Scheme of the quinone redox cycling process in *P. eryngii* (see Discussion for an explanation). (A) Main reactions involved in ROS production through BQ, MBQ, and DBQ redox cycling in the absence and presence of Fe^{3+}-EDTA (solid and dashed arrows, respectively). (B) MD redox cycling, showing hydroquinone propagation by $O_2^{\cdot -}$. Reversible reactions are indicated by double arrows.

Gómez-Toribio et al., Appl Environm Microbiol 75:3944-3953

Bacteria as decomposers

Ligninabbau durch Bakterien

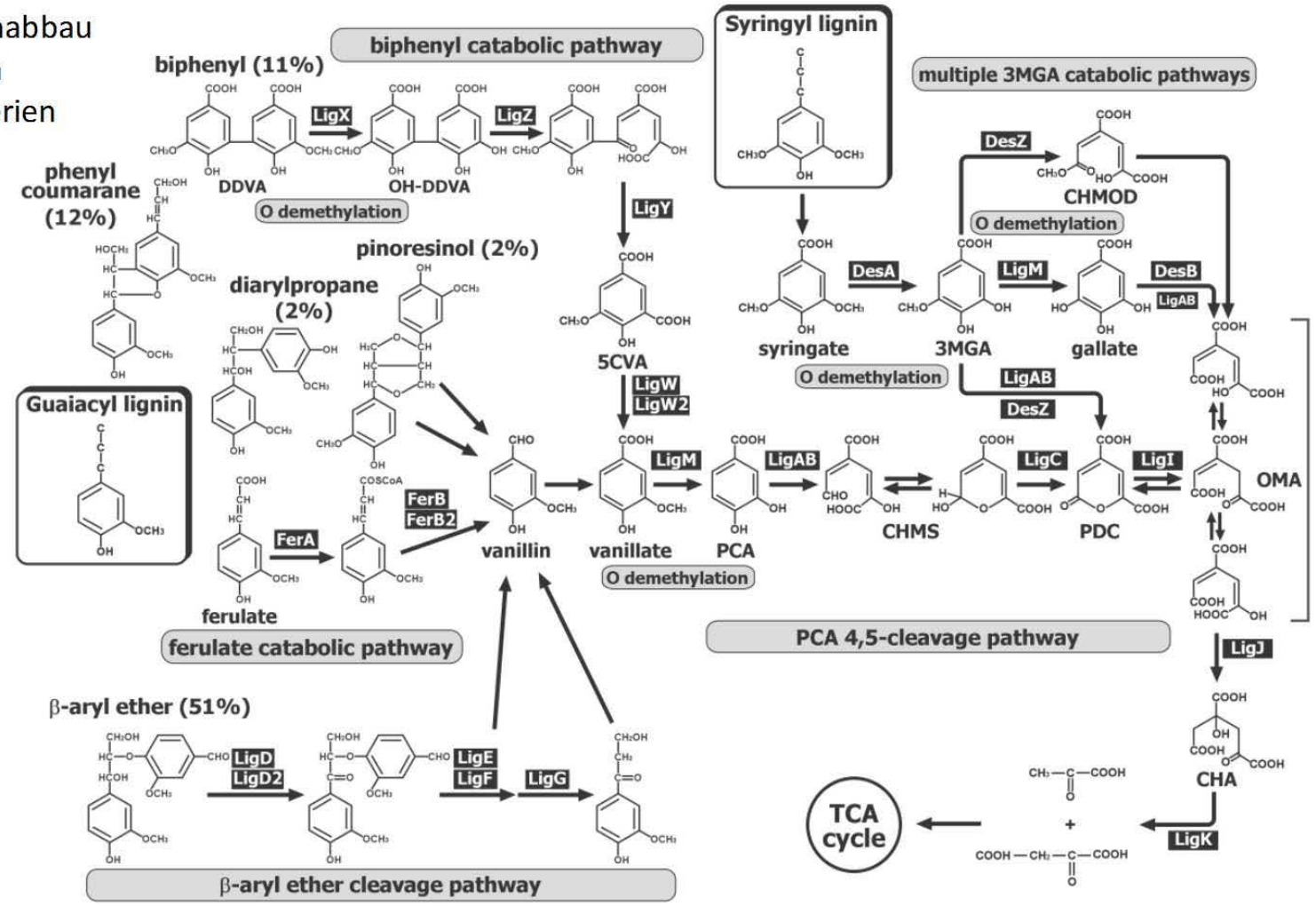
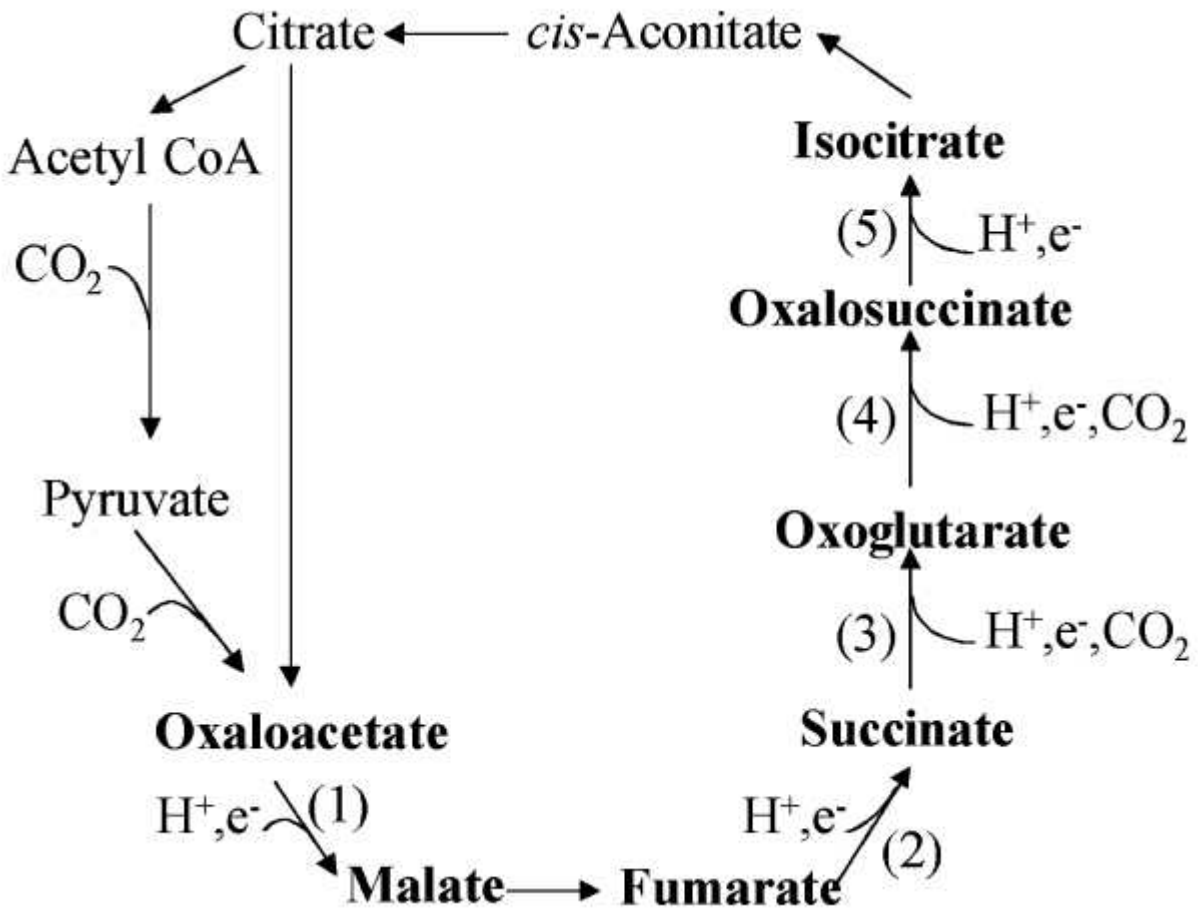


Fig. 1. Catabolic Pathways for the Degradation of Lignin-Derived Aromatic Compounds by *S. paucimobilis* SYK-6.

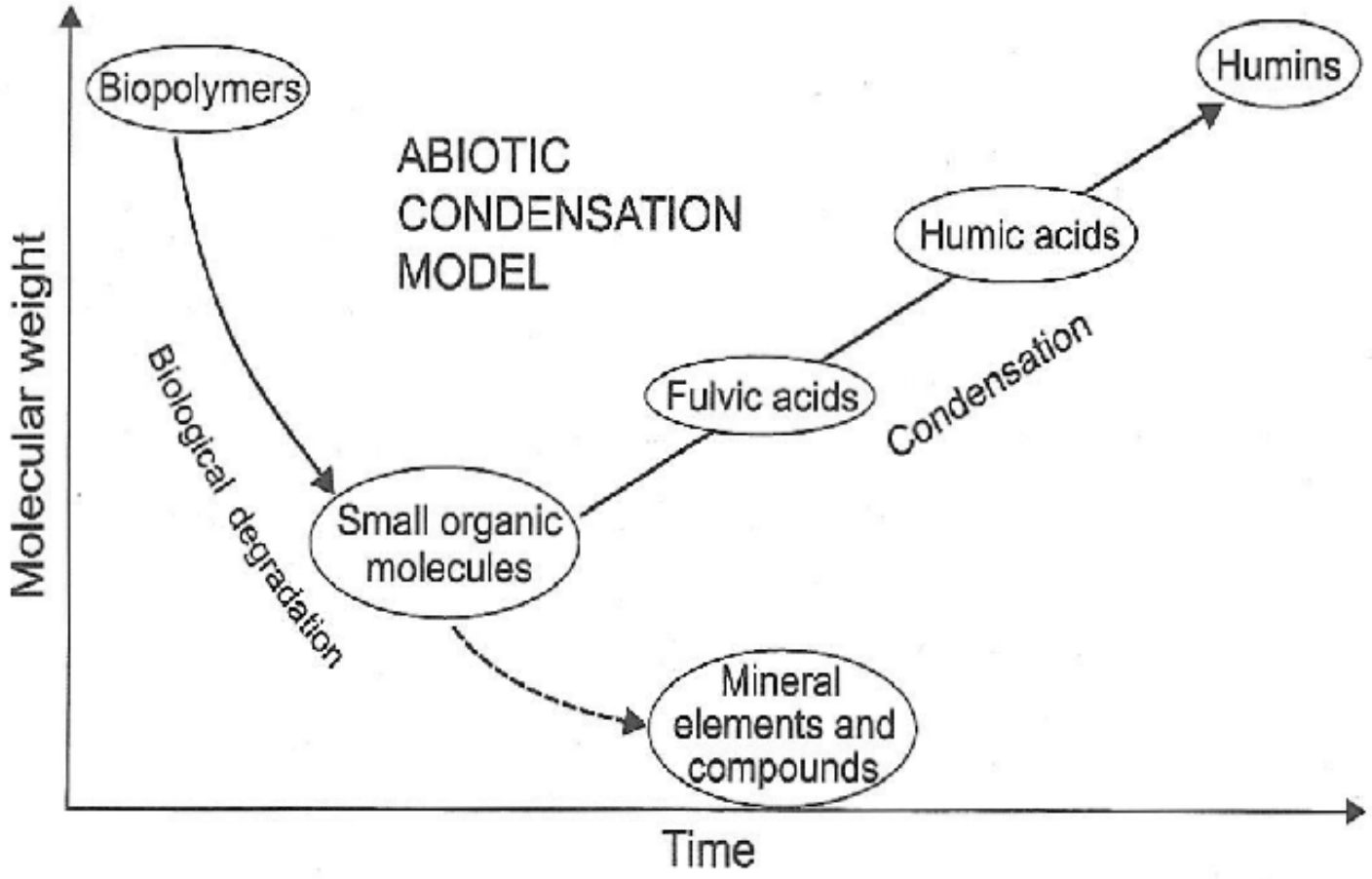
SYK-6 is able to grow on various lignin-derived biaryls and monoaryls *via* the PCA 4,5-cleavage pathway and the multiple 3MGA catabolic pathways. The percentages are the ratios of the intermonomer linkages in native lignin.[101] *Abbreviations*: DDVA, 5,5′-dehydrodivanillate; OH-DDVA, 2,2′,3-trihydroxy-3′-methoxy-5,5′-dicarboxybiphenyl; 5CVA, 5-carboxyvanillate; PCA, protocatechuate; CHMS, 4-carboxy-2-hydroxymuconate-6-semialdehyde; PDC, 2-pyrone-4,6-dicarboxylate; OMA, 4-oxalomesaconate; CHA, 4-carboxy-4-hydroxy-2-oxoadipate; 3MGA, 3-*O*-methylgallate; CHMOD, 4-carboxy-2-hydroxy-6-methoxy-6-oxohexa-2,4-dienoate; TCA, tricarboxylic acid.

Reverse TCA cycle



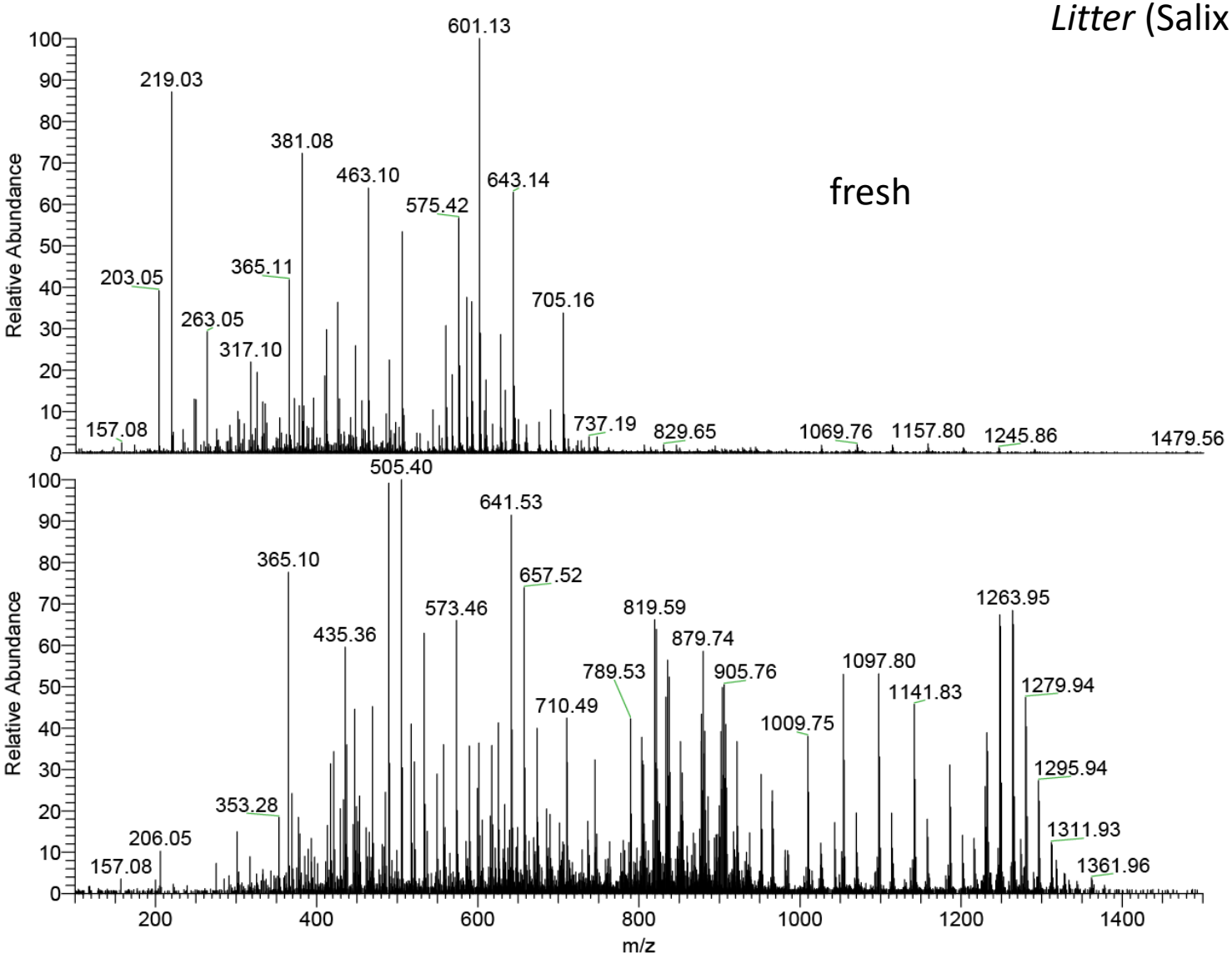
Zhang & Martin, JACS 128:10623-10633

Abiotic condensation model

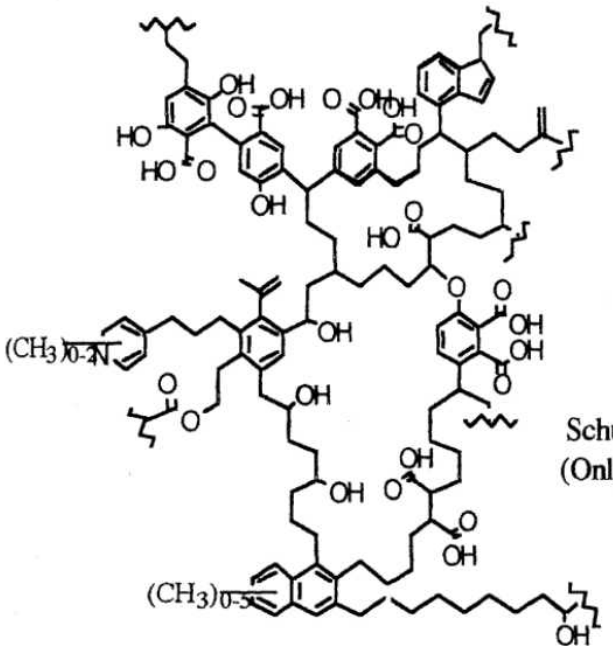


Abiotic condensation model

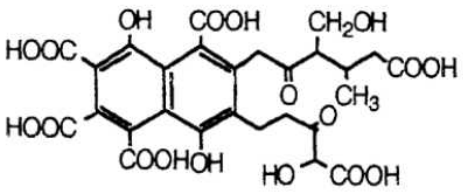
Litter (Salix sp.)



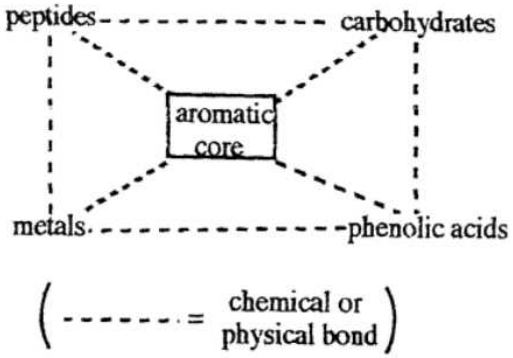
Humic and fulvic acid structure



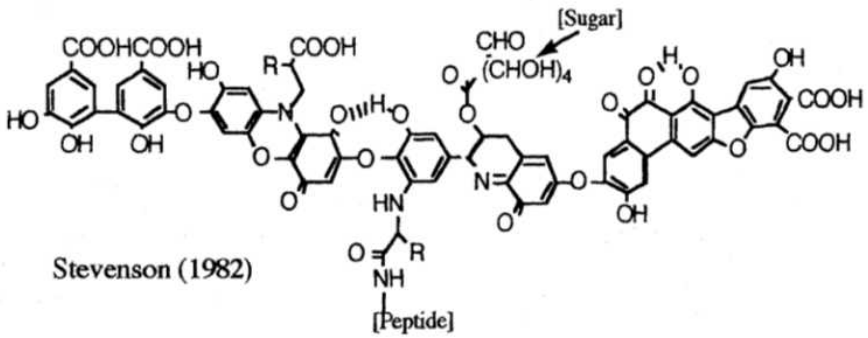
Schulten and Schnitzer (1997)
(Only part of structure shown)



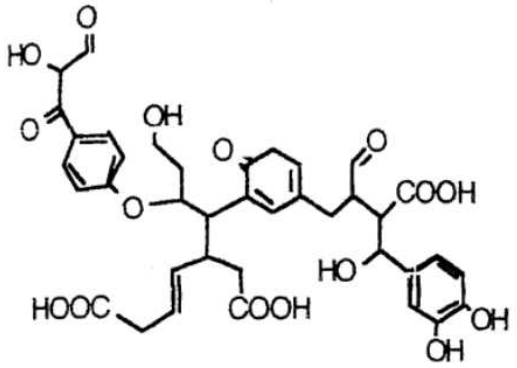
Buffle (1977)



Haworth, (1971)

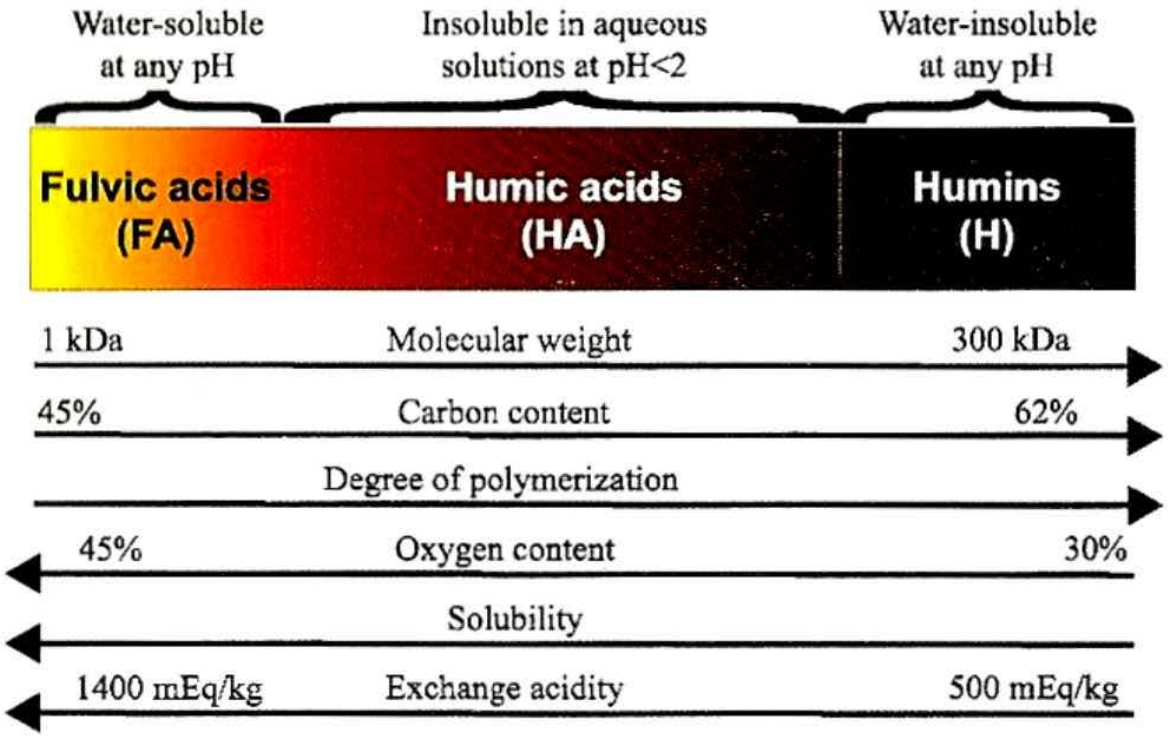


Stevenson (1982)



Stein et al., (1997)

Humic acids: classification



Björn Berg and Ryszard Laskowski, Chapter 6, Figure 1 Some general properties of the three main groups of separation products of humus. The groups are distinguished mainly on solubility criteria and may thus contain rich spectra of compounds. As general properties, we see that the molecular weight increases from fulvic acids to humic acids to humins, as does the degree of polymerization and carbon concentration. In contrast, the concentration of oxygen and exchange acidity (see Textbox 2) decrease from humins to fulvic acids. One Da (dalton) corresponds to the mass of 1/12 of the ^{12}C atom. After Stevenson (1994), modified.

Decomposition of lignin in litter

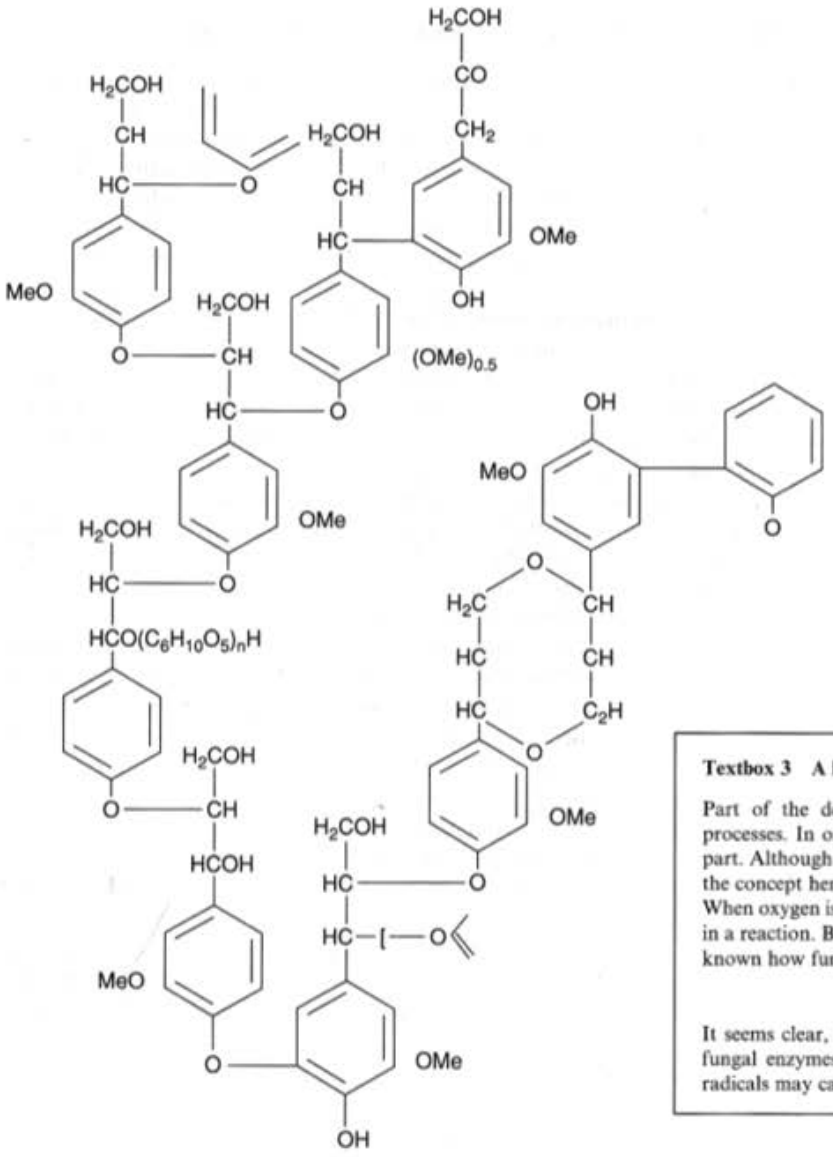
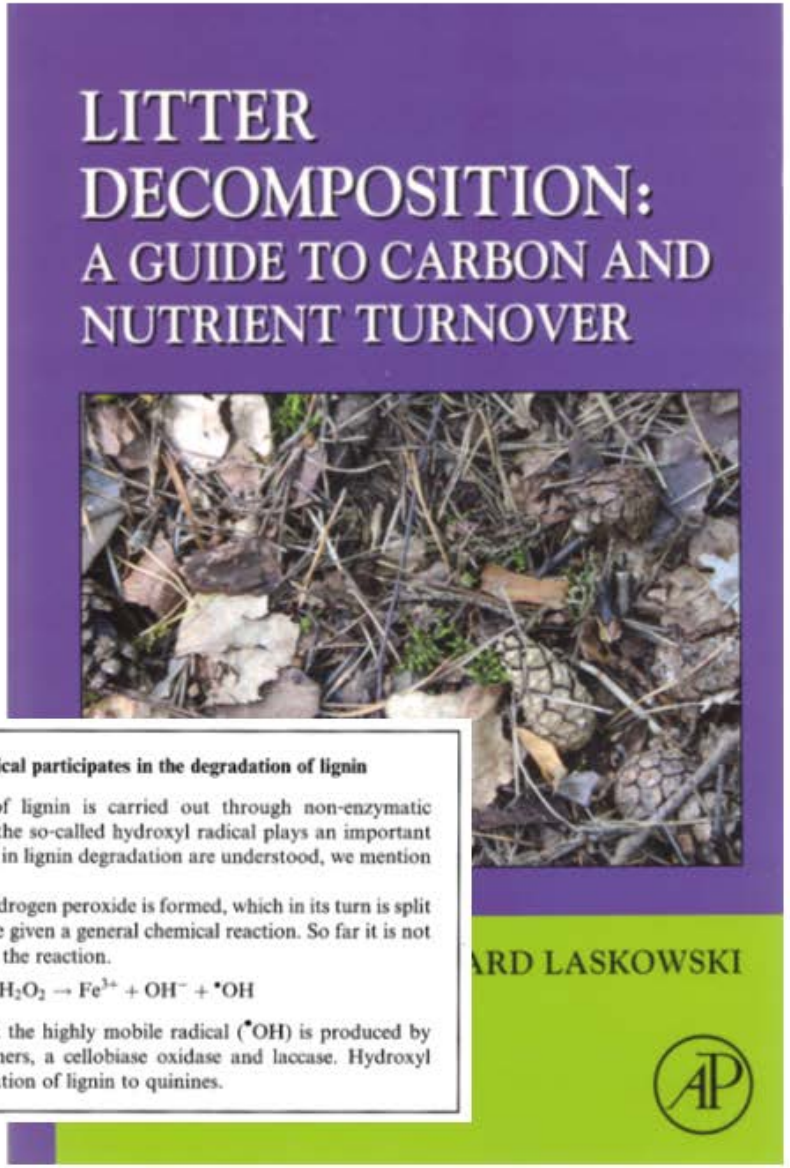


Figure 9 Lignin molecule from Norway spruce.



Textbox 3 A hydroxyl radical participates in the degradation of lignin

Part of the degradation of lignin is carried out through non-enzymatic processes. In one of these, the so-called hydroxyl radical plays an important part. Although not all steps in lignin degradation are understood, we mention the concept here.

When oxygen is reduced, hydrogen peroxide is formed, which in its turn is split in a reaction. Below we have given a general chemical reaction. So far it is not known how fungi carry out the reaction.

$$Fe^{2+} + H_2O_2 \rightarrow Fe^{3+} + OH^- + {}^{\bullet}OH$$

It seems clear, though, that the highly mobile radical ($^{\bullet}OH$) is produced by fungal enzymes, among others, a cellobiase oxidase and laccase. Hydroxyl radicals may cause an oxidation of lignin to quinines.

Haber-Weiss reaction

$$2\,O_2^{\bullet -} + 2\,H^+ \longrightarrow O_2 + H_2O_2$$

$$O_2^{\bullet -} + Fe^{3+} \longrightarrow Fe^{2+} + O_2$$

Fenton reaction: $H_2O_2 + Fe^{2+} \longrightarrow Fe^{3+} + {}^{\bullet}OH + {}^{-}OH$

Reactive Oxygen Species (ROS)

A

Name	Symbol	Radical	Ion	ROS	Primary sources in plants
Triplet oxygen	$^3O_2$	Yes	No	No	Photosystem II
Singlet oxygen***	$^1O_2$	No	No	Yes	Photodynamic transfer (excited chlorophylls, etc)
Superoxide**	$O_2^{\cdot-}$	Yes	Yes	Yes	Electron transport chains, oxidases
Hydrogen peroxide*	H_2O_2	No	No	Yes	Reduction/disumutation of superoxide, oxidases
Hydroxyl radical****	$OH^{\cdot}$	Yes	No	Yes	Reductive cleavage of H_2O_2
Water	H_2O	No	No	No	Absorption, various reactions
Hydroxide	OH^-	No	Yes	No	Various reactions, ionization of water

B

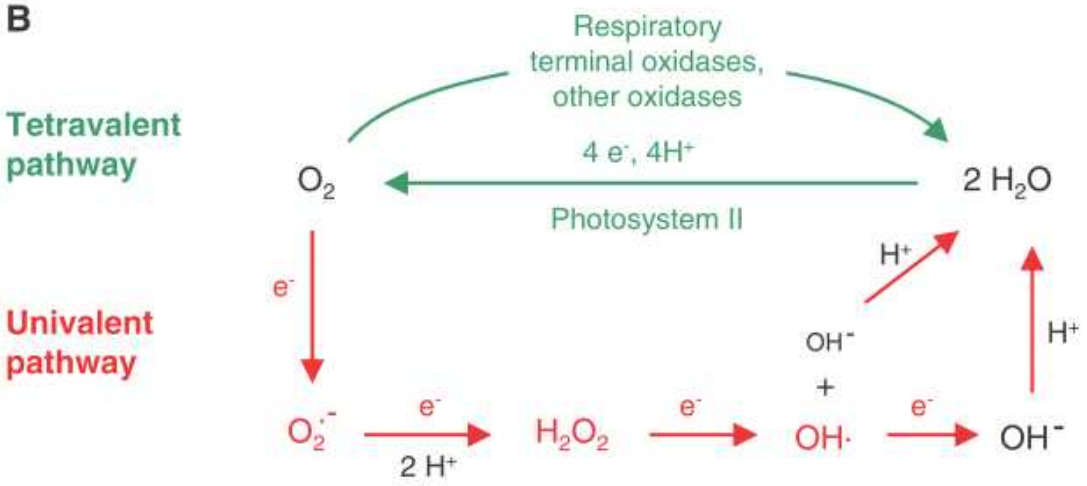
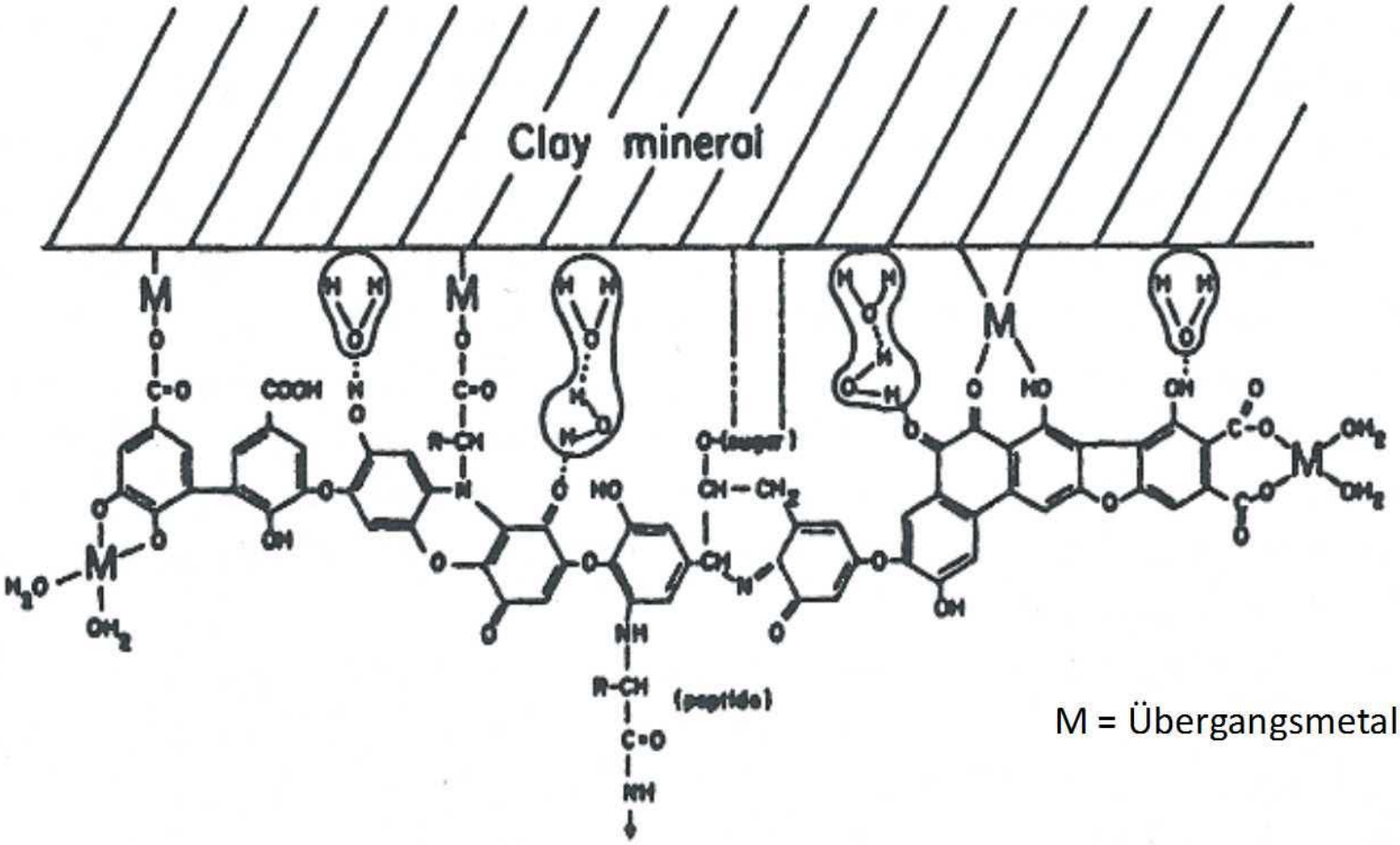


FIG. 2. Simple summary of principal chemical species of oxygen (A) and the two main paths of oxygen reduction (B). The scheme shows only the main forms thought to exist under physiological conditions. Protonated forms of superoxide and deprotonated forms of H_2O_2 also exist. The relative reactivities of the different ROS are denoted by *asterisks* in (**A**). The term 'ROS' refers to any triplet oxygen species that is more reactive than O_2; a radical is defined as a molecule carrying an unpaired electron; an ion refers to a compound that carries a charge (*i.e.*, its total number of electrons is not equal to its total number of protons).

Clay mineral sorption



M = Übergangsmetall

Fig. 18.3 Schematic diagram of clay–humate complex in soil. From Stevenson and Ardakani[20]