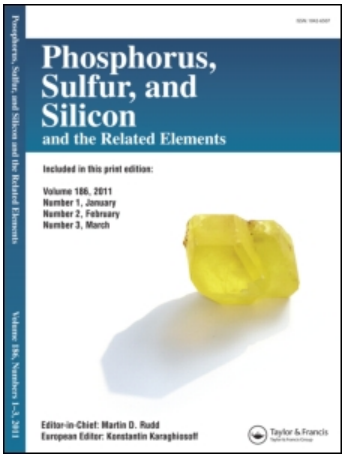

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Microwave-Assisted Synthesis of 2-Long Alkenyl Chain Benzoxazoles and Naphtho[2,3-*d*]oxazoles and Their Antimicrobial Evaluation

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Microwave-Assisted Synthesis of 2-Long Alkenyl Chain Benzoxazoles and Naphtho[2,3-*d*]oxazoles and Their Antimicrobial Evaluation

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A microwave-assisted combinatorial synthesis of 2-long alkenyl chain benzoxazoles and naphtho[2,3-d]oxazoles with a catalytic amount of phosphorus pentasulphide at ambient pressure has been developed. This procedure constitutes a simple, practical, and green synthetic method for benzoxazoles and their structural analogs. All the compounds ***[2(a–d) through 6(a–d)]*** *have been screened for antibacterial and antifungal activity. The compounds have showed good activity against Gram-positive and Gram-negative bacteria. All the compounds have also showed good results against almost all fungal strains. The structures of the synthesized compounds are elucidated by IR,* ^{1}H *NMR,* ^{13}C *NMR, MS data, and elemental analysis.*

Keywords 2-Alkenylbenzoxazoles; 2-aminophenols; antimicrobial activity; long alkenyl chain carboxylic acids; microwave irradiation; solvent-free

INTRODUCTION

The development of new methods for the synthesis of heterocyclic compound libraries, both in solution and in solid-phase, represents an expanding area of combinatorial chemistry. Benz-fused azoles are an important class of molecules and are common heterocyclic scaffolds in biologically active[1,2] and medicinally significant compounds.[3–7] The

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benzoxazole moiety also finds applications in material sciences[8] and proved to be efficient as a corrosion inhibitor for oil field applications.[9,10] The widespread interest in substituted benzoxazoles has prompted extensive exploration in their synthesis. Several methods were developed for the synthesis of the 2-substituted benzoxazole. These include the condensation of 2-aminophenol with the substituted carboxylic acids or its derivatives in the presence of polyphosphoric acid,[11] polyphosphate ester,[12] ionic liquid promoted synthesis,[13] palladium-catalyzed direct coupling of benzoxazoles with aryl bromides,[14] palladium-catalyzed condensation of aryl halides with 2-aminophenol followed by dehydrative cyclization,[15] intramolecular Mitsunobu reaction of 2-hydroxyanilide,[16] acid catalyzed deacylative condensation of the 2-acyloxyanilide,[17] and oxidative cyclization of phenolic Schiff's bases using various oxidants.[18,19] Although some methods have been used in preparing 2-substituted benzoxazoles, they suffer from drawbacks such as limitations in the preparation of the starting materials (acid fluorides/chlorides, 2-hydroxy/acyloxy anilides), the requirement of excess reagents (PPA/PPTS, p-TsOH, DCC/HF/py, PPh_3-DEAD, ionic liquids, etc.), harsh reaction conditions, long reaction time, and low isolation yields. In view of the pharmaceutical application values of benzoxazoles, it is worthwhile to search for milder and practical conditions that accelerate the cyclization rate of the benzoxazole moiety.

Microwave activation as an unconventional energy source has become a very popular and useful technology in organic chemistry, and the combination of solvent-free conditions using microwave irradiation (MW) and inorganic support have attracted immense interest as environmentally benign methodologies.[20] Microwave-assisted organic synthesis (MAOS) has been successfully adapted to combinatorial chemistry. Recently, some methods use MW heating for the synthesis of 2-substituted benzoxazoles such as synthesis via MW dielectric heating,[21] condensation of carboxylic acids with 2-aminophenol,[22] and condensation of aromatic aldehydes with 2-aminophenol using I_2 as catalyst.[23] To the best of our knowledge, no condensation using a catalytic amount of phosphorus pentasulphide from long alkenyl chain carboxylic acids has been reported so far. In view of the power of MAOS, we considered undertaking the design and synthesis of benzoxazoles and naphtho[2,3-*d*]oxazoles under the catalytic amount of phosphorus pentasulphide and microwave irradiation bearing long alkenyl chain, and their in vitro biological screening against Gram-positive and Gram-negative bacteria and fungi.

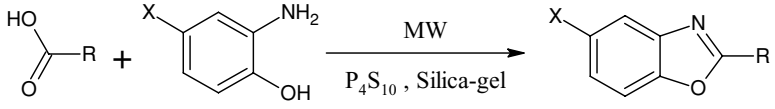
RESULTS AND DISCUSSION

Reactions with solid supported reagents are known to produce an enhanced reaction rate, higher selectivity, and greater efficiency. As part of our interest in solid-supported reagents in organic reactions,[24] we focused our attention on the preparation of 2-substituted benzoxazoles from olefinic and hydroxy olefinic long-chain carboxylic acids (Scheme 1).

In our initial attempts, the condensation reaction of 2-aminophenol with undec-10-enoic acid was chosen as a model to optimize the preparation of compounds [**2(a–d) through 5(a–d)**]. In order to determine the optimum conditions for the synthesis of 2-alkenylbenzoxazoles in a faster and more efficient way, molar ratios of reagents and the irradiation time and power level of microwave set-up were investigated (Table I).

But, microwave irradiation alone was not found to be effective to condense olefinic long chain carboxylic acids with 2-aminophenol in solvent-free conditions in good yields. The low yield suggests the necessity of catalysts for this reaction. The reagent chosen was P_4S_{10} as it could be safely used under microwave irradiation.[25,26]

To verify the auxiliary effect of the catalyst, we investigated the effects of phosphorus pentasulphide in the MW-assisted reaction of 2-aminophenol and undec-10-enoic acid (Table II). As shown in Table II, the yield of product formed in the absence of phosphorus pentasulphide was 60%, and only a small increase in yield of product was observed



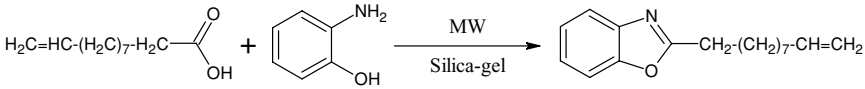
1(a-d) **(2 - 5)** **[2(a-d) – 5(a-d)]**

1	R
a	H_2C=CH–(CH$_2$)$_6$–CH$_2$–
b	–(CH$_2$)$_6$–CH=CH–(CH$_2$)$_5$–CH$_2$–
c	–(CH$_2$)$_4$–CH(OH)–CH=CH–(CH$_2$)$_5$–CH$_2$–
d	–(CH$_2$)$_3$–CH=CH–CH(OH)–(CH$_2$)$_6$–CH$_2$–

	X
2	H
3	CH_3
4	Cl
5	NO_2

SCHEME 1

TABLE I Optimization of the Microwave-Assisted Condensation of 1a and 2[a]



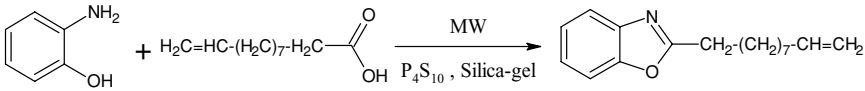
1a **2** **2a**

Entry	Support	Time (min)	Power (%)	Yield (%)[b]
1	Silica gel	25	10	17
2	Silica gel	25	20	45
3	Silica gel	25	30	48
4	Silica gel	25	50	54
5	Silica gel	25	60	60

[a]The mixture of the 2-aminophenol (2.5 mmol) and undec-10-enoic acid (3.75 mmol) was irradiated under microwave (multimode) using a domestic microwave oven.
[b]Isolated yield.

using 0.01 mmol phosphorus pentasulphide (Table II, entry 4). When 0.04 mmol phosphorus pentasulphide was used, the product was obtained in 78% yield (Table II, entry 3). Remarkably, when 0.08% phosphorus pentasulphide was used, the yield increased to 89% (Table II, entry 1). It was also found that the amount of phosphorus

TABLE II Effect of Phosphorus Pentasulphide and Its Amount on the Condensation Reaction[a]



Entry	Amount of catalyst (mmol)	Reaction time (min)[b]	Yield (%)[c]
1	0.08	6	89
2	0.06	6	89
3	0.04	15	78
4	0.01	20	65
5	0	25	60

[a]The mixture of the 2-aminophenol (2.5 mmol) and undec-10-enoic acid (3.75 mmol) with phosphorus pentasulphide (0.06 mmol) was irradiated under microwave oven at 60% power.
[b]Monitored by TLC.
[c]Isolated yield.

pentasulphide could be readily reduced to 0.06 mmol without compromising the yield.

The generality and scope of this new protocol was demonstrated by subjecting a wide range of 2-aminophenols with different long alkenyl chain carboxylic acids under MW (Table III). The employed reaction conditions showed that the chain length of the fatty acids (R) does not affect the reaction rate. Also the various functionalities present in the carboxylic acid such as double bond and hydroxyl group were tolerated. In contrast, the substituent in the aminophenols (X) did have an influence (Table III). For instance, when 2-amino-4-chloro phenol (Table III, entries 9–12) and 2-amino-4-nitrophenol (Table III, entries 13–16) were used, a longer reaction time was required as compared to its 4-methyl analogue (Table III, entries 5–8), whereas 2-aminophenol showed an intermediate reactivity (Table III, entries 1–4) in comparison with their 4-substituted analogues (X = CH_3, Cl, NO_2).

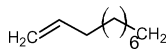
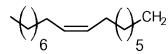
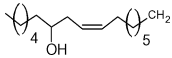
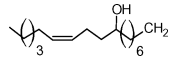
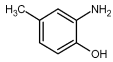
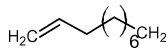
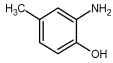
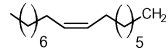
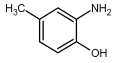
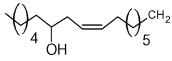
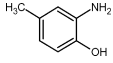
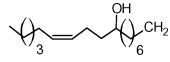
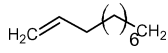
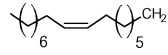
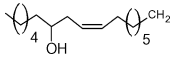
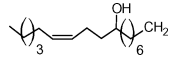
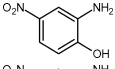
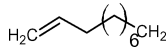
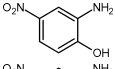
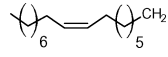
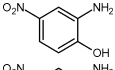
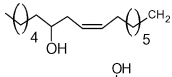
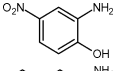
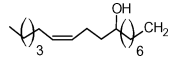
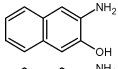
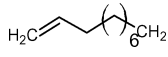
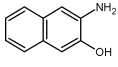
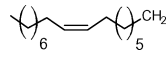
This strategy was also used to increase the structural diversity of the member library through the synthesis of naphtho [2, 3-*d*]-oxazole derivatives **[6(a–d)]** (Scheme 2).

A similar behavior was observed with 3-amino-2-naphthol **6** (Table III, entries 17–20) as with 2-aminophenol **2**. In general, the reactions proceeded efficiently in the presence of P_4S_{10} and completed within 6–14 min under solvent-free and MW-assisted conditions. In all cases, the products were clean as indicated by TLC, and pure benzoxazoles were conveniently obtained using silica-gel chromatography. All products were characterized from their IR, ^{1}H-, and ^{13}C NMR data, as well as mass spectrometry data. Detailed physical and spectral data are given in Tables VI and VII, respectively.

All the compounds **[2(a–d) through 6(a–d)]** were screened for antibacterial and antifungal activity. Screening results are summarized in Table IV and Table V. The minimum inhibitory concentrations (MIC) of all the tested compounds were 100 μg/ml. The newly generated compounds have exerted significant inhibitory activity against the growth of the test bacterial strains. The data pertaining to Table IV reveals that the compounds **3(a–d) through 5(a–d)** have significant influence on antibacterial profile of Gram-positive bacteria (*Bacillus subtilis* and *Staphylococcus aureus*) as well as Gram-negative bacteria (*Escherichia coli* and *Salmonella typhimurium*) bacteria. The moderate activity against all bacterial strains were obtained by compounds **2(a–d)** and **6(a–d)**.

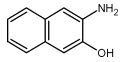
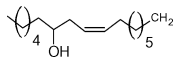
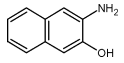
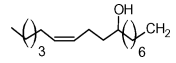
In another set of experiments, the above-mentioned compounds were also examined for antifungal activity (Table V) . Nystatin was used as standard drug for the comparison of antifungal results. Against all fungal strains (*Helminthosporum oryzae*, *Aspergillus niger*, *Penicillium*

TABLE III Condensation of Various Carboxylic Acids (RCOOH) with 2-Aminophenols Under Microwave Irradiation[a]

Entry	2-Aminophenol	R	Reaction time	Product	Yield (%)
1			6	**2a**	89
2			7	**2b**	89
3			7	**2c**	87
4			7	**2d**	87
5			8	**3a**	87
6			8	**3b**	85
7			9	**3c**	85
8			9	**3d**	87
9			11	**4a**	87
10			12	**4b**	85
11			12	**4c**	85
12			12	**4d**	84
13			13	**5a**	82
14			13	**5b**	83
15			14	**5c**	80
16			14	**5d**	80
17			8	**6a**	88
18			8	**6b**	87

(Continued on next page)

TABLE III Condensation of Various Carboxylic Acids (RCOOH) with 2-Aminophenols Under Microwave Irradiation[a] *(Continued)*

Entry	2-Aminophenol	R	Reaction time	Product	Yield (%)
19			9	**6c**	86
20			9	**6d**	86

[a]The mixture of the 2-aminophenol (2.5 mmol) and fatty acids (3.75 mmol) with 0.06 mmol of P_4S_{10} was irradiated under microwave using a domestic microwave oven at 60% power.

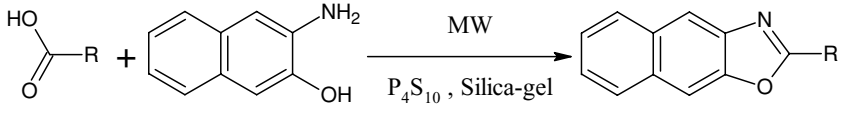
[b] Isolated yield of the 2-alkenylbenzoxazoles, confirmed by ^{1}H NMR, ^{13}C NMR, MS and elemental analysis.

sp., *Trichoderma viridae*, and *Candida albicans)*, compounds **3(a–d) through 5(a–d)** showed excellent inhibitory results. However compounds **2(a–d)** and **6(a–d)** showed moderate activity against all fungal strains.

Antimicrobial Screening

Antibacterial Screening

Antibacterial activity of the synthesized compounds **[2(a–d) through 6(a–d)]** were studied against four bacteria, viz., *Escherichia coli* (K12), *Staphylococcus aureus* (MSSA 22), *Salmonella typhimurium* (MTCC 98), and *Bacillus subtilis* (ATCC 6051). For the detection of antibacterial activity, the disc diffusion method with little modification was used.[27] Nutrient agar (NA) was used as basal medium for test bacteria. Briefly 0.1 mL of diluted inoculum (10^5 CFU/ml) of test organism was spread on nutrient agar (NA). Sterile filter paper (Hi-Media Pvt Ltd, Mumbai, India) disc (8 mm) impregnated with 100 μg of compound and a disc without compound was used as a negative control. The NA was incubated for 18 h at 37°C for test bacteria. The antimicrobial activity was evaluated by measuring the zone of growth inhibition of the



1(a-d) **6** **6(a-d)**

SCHEME 2

TABLE IV Antibacterial Activity of Compounds 2(a–d) Through 6(a–d)

	Diameter of zone of inhibition (mm) at 100 μg/mL			
	Gram negative		*Gram positive*	
Compound	*E. coli*	*S. tyhimurium*	*B. subtilis*	*S. aureus*
2a	14	12	18	20
2b	13	14	17	20
2c	14	13	15	18
2d	15	13	16	17
3a	19	14	18	20
3b	17	13	19	19
3c	18	14	17	18
3d	18	13	17	17
4a	19	16	20	21
4b	18	16	21	22
4c	20	15	19	20
4d	20	15	19	20
5a	21	16	21	19
5b	18	15	21	20
5c	20	15	19	19
5d	19	15	19	19
6a	17	14	18	18
6b	17	12	19	20
6c	16	11	17	18
6d	16	11	17	18
Chloramphenicol	25	20	24	26
Control DMSO	–	–	–	–

test organism in mm. Chloramphenicol (Hi-Media Pvt Ltd, Mumbai, India) was used as standard antibiotic for antibacterial activity. The compounds were dissolved in DMSO.

Antifungal Screening

Antifungal activity of the synthesized compounds **[2(a–d) through 6(a–d)]** was studied against 5 fungi viz.,*Helminthosporum oryzae* (2537, laboratory isolate, Agricultural Research Station, Jaipur, India), *Aspergillus niger* (laboratory isolate), *Penicillium* sp. (laboratory isolate), *Trichoderma viridae* (laboratory isolate), and *Candida albicans* (IOA 109). The disc diffusion method with little modification was used.[27] Briefly 0.1 mL of diluted inoculum (10^5 CFU/ml) of test organism was spread on sabouraud dextrose (SD) agar plates. Sterile filter paper (Hi-Media Pvt Ltd, Mumbai, India) disc (8 mm) impregnated with 100 μg of compound and a disc without compound was used as a

TABLE V Antifungal Activity of Compounds 2(a–d) Through 6(a–d)

Compound	Diameter of zone of inhibition (mm) at 100 μg/ml				
	C. albicans	*H. oryzae*	*A. niger*	*T. viridae*	*Penicillium.* sp
2a	14	9	10	9	12
2b	15	9	10	10	13
2c	15	7	9	9	11
2d	15	7	9	8	12
3a	16	10	11	11	14
3b	15	11	11	11	14
3c	16	9	10	10	12
3d	16	9	10	10	12
4a	17	13	12	12	14
4b	17	12	13	12	15
4c	16	11	12	11	14
4d	16	12	12	11	14
5a	17	12	12	13	14
5b	17	12	12	12	15
5c	16	11	11	12	14
5d	16	10	11	12	14
6a	15	10	10	10	12
6b	16	9	9	11	11
6c	14	9	9	10	11
6d	14	8	9	9	10
Nystatin	20	15	16	15	18
Control DMSO	–	–	–	–	–

negative control. The agar plates were incubated for 18 h at 37°C for *Candida albicans* and at 25°C for 5–6 days for filamentous fungi. The antifungal activity was evaluated by measuring the zone of growth inhibition of the test organism in mm. Antibiotic nystatin (Hi-Media Pvt Ltd, Mumbai, India) were used in the test system as positive controls. The compounds were dissolved in DMSO.

EXPERIMENTAL

Undec-10-enoic **(1a)** and (*Z*)-octadec-9-enoic **(1b)** acids were obtained commercially from Fluka Chemical (Switzerland). (9*Z*, 12*R*)-12-Hydroxyoctadec-9-enoic (ricinoleic) **(1c)** and (9*R*, 12*Z*)-9-hydroxyoctadec-12-enoic (isoricinoleic) **(1d)** acids were isolated from the natural sources, i.e., from *Ricinus communis* and *Wrightia tinctoria* seed oils respectively following Gunstone's partition method.[28] All other chemicals (Aldrich) were used as received. The eluent for TLC was a mixture of hexane/diethyl ether in varying proportions for different

TABLE VI Physical and Analytical Data of the Newly Synthesized Compounds [2(a–d) Through 6(a–d)]

Compound	Color	Nature	Mol. formula (mol.wt.)	Analysis % found (calcd.)		
				C	H	N
2a	**Colorless**	Oily	$C_{17}H_{23}NO$ (257.35)	79.04 (79.34)	8.94 (9.00)	5.38 (5.44)
2b	**Yellow**	Oily	$C_{24}H_{37}NO$ (355.52)	81.42 (81.08)	10.39 (10.48)	3.88 (3.94)
2c	**Yellow**	Viscous	$C_{24}H_{37}NO_2$ (371.52)	77.19 (77.59)	10.12 (10.03)	3.84 (3.77)
2d	**Yellow**	Viscous	$C_{24}H_{37}NO_2$ (371.52)	77.29 (77.59)	9.96 (10.03)	3.71 (3.77)
3a	**Colorless**	Oily	$C_{18}H_{25}NO$ (271.37)	79.99 (79.67)	9.24 (9.28)	5.21 (5.16)
3b	**Light Yellow**	Oily	$C_{25}H_{39}NO$ (369.55)	81.65 (81.25)	10.71 (10.63)	3.86 (3.79)
3c	**Yellow**	Viscous	$C_{25}H_{39}NO$ (385.55)	77.50 (77.88)	10.11 (10.19)	3.69 (3.63)
3d	**Yellow**	Viscous	$C_{25}H_{39}NO_2$ (385.55)	77.55 (77.88)	10.28 (10.19)	3.67 (3.63)
4a	**Colorless**	Oily	$C_{17}H_{22}ClNO$ (291.79)	70.25 (69.98)	7.46 (7.59)	4.89 (4.80)
4b	**Yellow**	Oily	$C_{24}H_{36}ClNO$ (389.97)	73.58 (73.92)	9.42 (9.30)	3.70 (3.59)
4c	**Light brown**	Viscous	$C_{24}H_{36}ClNO_2$ (405.97)	70.88 (71.01)	9.01 (8.93)	3.36 (3.45)
4d	**Light brown**	Viscous	$C_{24}H_{36}ClNO_2$ (405.97)	70.79 (71.01)	8.82 (8.93)	3.39 (3.45)
5a	**Light yellow**	Oily	$C_{17}H_{22}N_2O_3$ (302.34)	67.82 (67.54)	7.46 (7.33)	9.41 (9.26)
5b	**Yellow**	Oily	$C_{24}H_{36}N_2O_3$ (400.51)	71.62 (71.98)	9.17 (9.05)	7.09 (6.99)
5c	**Brown**	Viscous	$C_{24}H_{36}N_2O_4$ (416.51)	69.58 (69.20)	8.63 (8.71)	6.92 (6.72)
5d	**Brown**	Viscous	$C_{24}H_{36}N_2O_4$ (416.51)	69.45 (69.20)	8.87 (8.71)	6.87 (6.72)
6a	**Colorless**	Oily	$C_{21}H_{25}NO$ (307.41)	81.88 (82.05)	8.02 (8.19)	4.48 (4.55)
6b	**Light yellow**	Oily	$C_{28}H_{39}NO$ (405.58)	82.71 (82.92)	9.87 (9.68)	3.57 (3.45)
6c	**Yellow**	Viscous	$C_{28}H_{39}NO_2$ (421.58)	79.98 (79.77)	9.44 (9.32)	3.43 (3.32)
6d	**Light brown**	Viscous	$C_{28}H_{39}NO_2$ (421.58)	79.92 (79.77)	9.23 (9.32)	3.46 (3.32)

TABLE VII Spectral Data of the Newly Synthesized Compounds

Comp. no.	Spectral data
2a	IR: 2985(CH), 1650 (C═N), 1435(CO) ^{1}H NMR: 7.66-7.68 (m,1H, Ar-H), 7.49-7.47 (m,1H, Ar-H), 7.31-7.29 (m, 2H, Ar-H), 5.85-5.75 (tdd, 1H, $J_{H-^8CH_2}$ 6.6 Hz, J_{H-H_Z} 10.2 Hz, J_{H-H_E} 17.1 Hz, CH_2═$\underline{CH}$-), 5.01-4.91(dd, 1H, J_{H_Z-H}10.2 Hz, $J_{H_Z-H_E}$ 1.2 Hz, $\underline{H_Z}$C═CH-), 4.90 (dd,1H, J_{H_E-H} 17.1 Hz, $J_{H_E-H_Z}$ 1.2 Hz, $\underline{H_E}\underline{C}$═CH-), 2.92 (t, 2H, $J = 7.62$ Hz, $\underline{CH_2}$ α to oxazole ring), 2.03-2.01 (2H, m, -$\underline{CH_2}$-CH═CH_2), 1.91-1.87 (m, 2H, -$\underline{CH_2}$ β to ozazole ring), 1.31 (br.s, 10H, chain $\underline{CH_2}$). ^{13}C NMR: 29.2, 33.8, 34.3, 110.8, 114.2; 121.5, 124.6, 125.8, 139.1, 140.4, 153.3, 159.7. MS: 257 (34%), 160 (23%), 146 (31%), 132 (100%), 118(19%).
2b	IR: 2980(CH), 1655(C═N), 1430(CO) ^{1}H NMR: 7.65-7.67 (m,1H, Ar-H), 7.48-7.47 (m,1H, Ar-H), 7.31-7.27 (m, 2H, Ar-H), 5.37-5.33 (m, 2H, -$\underline{CH}$═$\underline{CH}$-), 2.91(t, 2H, $J = 7.52$ Hz, -$\underline{CH_2}$ α to oxazole ring), 2.05-2.01(m, 4H, -$\underline{CH_2}$-CH═CH-$\underline{CH_2}$-), 1.92-1.84 (m, 2H, -$\underline{CH_2}$ β to oxazole ring), 1.29 (br.s, 20H, chain $\underline{CH_2}$), 0.88 (dist.t, 3H, $\underline{CH_3}$); ^{13}C NMR: 14.1, 22.7, 29.3, 31.9, 33.5, 34.3, 111.3, 121.5, 124.6, 125.7, 130.0, 139.7, 152.4, 159.8. MS: 355 (37%), 256 (40%), 242 (35%), 132(100%), 118 (15%).
2c	IR: 2895(CH), 1690(C═N), 1435(CO); ^{1}H NMR: 7.65- 7.68 (m,1H, Ar-H), 7.49- 7.47 (m,1H, Ar-H), 7.33-7.28 (m, 2H, Ar-H), 5.49-5.44 (m, 2H, -$\underline{CH}$═$\underline{CH}$-), 3.69-3.67 (m, 1H, -$\underline{CH}$-OH), 2.89 (t, 2H, $J = 7.6$ Hz, -$\underline{CH_2}$ α to oxazole ring) , 2.43-2.41 (m,1H, -CH-O$\underline{H}$), 2.04-1.98 (m, 4H, -$\underline{CH_2}$-CH═CH-$\underline{CH_2}$-), 1.90–1.87 (m, 2H, -$\underline{CH_2}$ β to oxazole ring) , 1.29 (br.s, 18H, chain $\underline{CH_2}$), 0.88 (dist.t, 3H, $\underline{CH_3}$); ^{13}C NMR: 14.1, 22.6, 25.3, 29.6, 31.5, 31.9, 34.3, 39.1, 71.5, 110.2, 121.5, 124.6, 125.9, 130.1, 139.1, 153.1, 159.3. MS: 371 (40%), 286 (38%), 242 (30%), 132(100%), 118 (24%).
2d	IR: 2895(CH), 1650(C═N), 1435(CO) ^{1}H NMR: 7.66- 7.68 (m,1H, Ar-H), 7.49- 7.47 (m,1H, Ar-H), 7.31-7.29 (m, 2H, Ar-H), 5.49-5.44 (m, 2H, -$\underline{CH}$═$\underline{CH}$-), 4.08-4.01(m, 1H, -$\underline{CH}$-OH), 2.88 (t, 2H, $J = 7.2$ Hz, -$\underline{CH_2}$ α to oxazole ring), 2.33-2.26 (m, 1H, -CH-O$\underline{H}$), 2.07-2.00 (m,4H, -$\underline{CH_2}$-CH═CH-$\underline{CH_2}$-), 1.89-1.84 (m, 2H, -$\underline{CH_2}$ β to oxazole ring), 1.44 (br.s, 18H, chain $\underline{CH_2}$), 0.98 (dist.t, 3H, $\underline{CH_3}$); ^{13}C NMR: 14.1, 22.3, 29.2, 30.9, 31.5, 34.3, 37.2, 72.1, 110.3, 121.5, 124.6, 125.9, 130.5, 139.4, 153.1, 159.7. MS: 371 (39%), 314 (40%), 300 (30%), 132(100%), 118 (22%).
3a	IR: 2850(CH), 1695(C═N), 1475(CO) ^{1}H NMR: 7.61 (s,1H, Ar-H), 7.43 (dd, $J = 8.0$, 1.0 Hz, 1H, Ar-H), 7.31 (dd, $J = 8.0$, 1.2 Hz, 1H, Ar-H), 5.85-5.75 (tdd, 1H, $J_{H-^8CH_2}$ 6.6 Hz, J_{H-H_Z} 10.2 Hz, J_{H-H_E} 17.1 Hz, CH_2═$\underline{CH}$-), 5.01-4.91(1H, dd, J_{H_Z-H}10.2 Hz, $J_{H_Z-H_E}$ 1.2 Hz, $\underline{H_Z}\underline{C}$═CH-), 4.90 (1H, dd, J_{H_E-H} 17.1 Hz, $J_{H_E-H_Z}$ 1.2 Hz, $\underline{H_E}\underline{C}$═CH-), 2.33 (s, 3H), 2.91 (t, 2H, $J = 7.20$ Hz, $\underline{CH_2}$ α to oxazole ring), 2.06-2.00 (m, 2H, -$\underline{CH_2}$-CH═CH_2), 1.91-1.87 (m, 2H, -$\underline{CH_2}$ β to oxazole ring), 1.30 (br.s, 10H, chain $\underline{CH_2}$);

(Continued on next page)

TABLE VII Spectral Data of the Newly Synthesized Compounds *(Continued)*

Comp. no.	Spectral data
	^{13}C NMR: 21.8, 29.2, 33.8, 34.3, 110.8, 114.2, 118.5, 124.6, 133.8, 139.1, 140.4, 148.3, 166.7.
	MS: 271 (28%), 160 (41%), 146 (100%), 132 (23%).
3b	IR: 2840(CH), 1695(C═N), 1466(CO)
	^{1}H NMR: 7.60 (s,1H, Ar-H), 7.44 (dd, $J = 8.0$, 1.0 Hz, 1H), 7.31 (dd, $J = 8.0$, 1.2 Hz, 1H), 5.37-5.33 (m, 2H,-CH═CH-), 2.34 (s, 3H), 2.91(2H, t, J 7.52 Hz, -CH_2 α to oxazole ring), 2.05-2.01(4H, m, -CH_2-CH═CH-CH_2-), 1.92-1.87 (2H, m, -CH_2 β to oxazole ring), 1.29 (20H, br.s, chain CH_2), 0.88 (3H, dist.t, CH_3);
	^{13}C NMR: 166.8, 140.6, 148.2, 109.8, 125.0, 133.2, 118.9, 33.5, 31.9, 34.3, 130.0, 29.3, 22.7, 21.7, 14.1;
	MS: 369 (36%), 270 (42%), 256 (35%), 146 (100%), 132 (25%).
3c	IR: 2850(CH), 1685(C═N), 1475(CO)
	^{1}H NMR: 7.62 (s,1H, Ar-H), 7.43 (dd, $J = 8.0$,1.0 Hz,1H, Ar-H), 7.33 (dd, $J = 8.0$, 2.0Hz, 1H, Ar-H), 5.49-5.44 (m, 2H, -CH═CH-), 3.69-3.67 (m,1H, -CH-OH), 2.32 (s, 3H), 2.90 (t, 2H, $J = 7.6$ Hz, -CH_2 α to oxazole ring) , 2.43-2.41 (m, 1H,-CH-OH), 2.04-1.98 (m, 4H, -CH_2-CH═CH-CH_2-), 1.90.1.87 (m, 2H, -CH_2 β to oxazole ring) , 1.29 (br.s, 18H, chain CH_2), 0.88 (dist.t, 3H, CH_3);
	^{13}C NMR: 14.1, 21.8, 22.6, 25.3, 29.6, 31.5, 31.9, 34.3, 39.1, 71.5, 109.9, 118.8, 125.2, 130.1, 133.3, 139.9, 148.2, 167.9.
	MS: 385 (22%), 300 (37%), 270 (39%), 256 (22%), 146(100%), 132 (26%).
3d	IR: 2855(CH), 1684(C═N), 1470 (CO)
	^{1}H NMR: 7.62 (s,1H, Ar-H), 7.43(dd, $J = 8.0$, 1.2 Hz,1H, Ar-H), 7.33 (dd, $J = 8.0$, 1.0 Hz,1H, Ar-H), 5.49-5.44 (m, 2H, -CH═CH-), 4.08-4.01(m,1H, -CH-OH), 2.33 (s, 3H), 2.88 (t, 2H, $J = 7.2$ Hz, -CH_2 α to oxazole ring), 2.33-2.26 (m, 1H, -CH-OH), 2.07-2.00 (m, 4H, -CH_2-CH═CH-CH_2-), 1.89-1.84 (m, 2H, -CH_2 β to oxazole ring), 1.44 (br.s, 18H, chain CH_2), 0.98 (dist.t, 3H, CH_3);
	^{13}C NMR: 14.1, 21.8, 22.3, 29.2, 30.9, 31.5, 34.3, 37.2, 72.1, 109.8, 118.8, 125.3, 130.5, 133.2, 139.6, 148.2, 167.9.
	MS: 385 (32%), 328 (38%), 314 (39%), 146(100%), 132 (26%).
4a	IR: 2850(CH), 1590(C═N), 1465(CO)
	^{1}H NMR: 6.91 (dd, $J = 8.4$, 2.8 Hz,1H, Ar-H), 7.30 (d, $J = 8.4$ Hz,1H, Ar-H), 8.13 (d, $J = 1.8$ Hz, 1H, Ar-H), 5.84-5.75 (tdd, 1H, $J_{H-^8CH_2}$ 6.6 Hz, J_{H-Hz} 10.2 Hz, J_{H-H_E} 17.1 Hz, CH_2═CH-), 5.01-4.91(dd, 1H, J_{Hz-H}10.2 Hz, J_{Hz-H_E} 1.2 Hz, H_ZC═CH-), 4.90 (1H, dd, J_{H_E-H} 17.1 Hz, $J_{H_E-H_Z}$ 1.2 Hz, H_EC═CH-), 2.33 (s, 3H), 2.79 (t, 2H, $J = 7.20$ Hz, CH_2 α to oxazole ring), 2.06-2.00 (m, 2H, -CH_2-CH═CH_2), 1.91-1.87 (2H, m, —CH_2 β to oxazole ring), 1.30 (10H, br.s, chain CH_2);
	^{13}C NMR: 29.2, 33.8, 34.3, 110.8, 114.2, 119.1, 124.2, 129.1, 139.1, 141.4, 148.3, 168.1.
	MS: 293 (13%), 291 (37%), 181 (40%), 167 (100%), 153 (23%).

(Continued on next page)

TABLE VII Spectral Data of the Newly Synthesized Compounds *(Continued)*

Comp. no.	Spectral data
4b	IR: 2854 (CH), 1585(C═N), 1470 (CO) ^{1}H NMR: 7.01 (dd, $J = 8.2$, 2.8 Hz,1H, Ar-H), 7.30 (d, $J = 8.4$ Hz, 1H, Ar-H), 7.39 (d, $J = 1.8$ Hz, 1H, Ar-H), 5.37-5.33 (m, 2H, -CH═CH-), 2.77 (t, 2H, $J = 7.52$ Hz, -CH_2 α to oxazole ring), 2.05-2.01(m, 4H, -CH_2-CH═CH-CH_2-), 1.92-1.84 (m, 2H, -CH_2 β to oxazole ring), 1.29 (br.s, 20H, chain CH_2), 0.88 (dist.t, 3H, CH_3); ^{13}C NMR: 14.1, 22.7, 29.3, 31.9, 33.5, 34.3, 110.8, 119.1, 124.3, 129.2, 130.0, 141.4, 148.3, 168.1. MS: 391 (12%), 389 (37%), 291 (41%), 277 (33%), 167 (100%), 153 (22).
4c	IR: 2860(CH), 1595(C═N), 1475(CO) ^{1}H NMR: 7.11 (dd, $J = 8.2$, 2.4 Hz,1H, Ar-H), 7.30 (d, $J = 8.4$ Hz, 1H, Ar-H), 7.40 (d, $J = 1.8$ Hz,1H, Ar-H), 5.49-5.44 (m, 2H, -CH═CH-), 3.69-3.67 (m, 1H, -CH-OH), 2.79 (t, 2H, $J = 7.6$ Hz, -CH_2 α to oxazole ring), 2.43-2.41 (m, 1H, -CH-OH), 2.04-1.98 (m, 4H, -CH_2-CH═CH-CH_2-), 1.90–1.88 (m, 2H, -CH_2 β to oxazole ring) , 1.29 (br.s, 18H, chain CH_2), 0.88 (dist.t, 3H, CH_3); ^{13}C NMR: 14.1, 22.6, 25.3, 29.6, 31.5, 31.9, 34.3, 39.1, 71.5, 110.8, 119.2, 124.4, 129.1, 130.1, 141.4, 148.3, 168.1. MS: 407 (10%), 405 (31%), 329 (44%), 285 (23%), 167(100%), 153 (20%).
4d	IR: 2855 (CH), 1580 (C═N), 1470 (CO) ^{1}H NMR: 7.12 (dd, $J = 8.2$, 1.8 Hz,1H, Ar-H), 7.33 (d, $J = 8.4$ Hz,1H, Ar-H), 7.41 (d, $J = 1.8$ Hz,1H, Ar-H), 5.49-5.44 (m, 2H, -CH═CH-), 4.08-4.01(m, 1H, -CH-OH), 2.80 (t, 2H, $J = 7.2$ Hz, -CH_2 α to oxazole ring), 2.33-2.26 (m,1H, -CH-OH), 2.07-2.00 (m, 4H, -CH_2-CH═CH-CH_2-), 1.89-1.84 (m, 2H, -CH_2 β to oxazole ring), 1.44 (br.s, 18H, chain CH_2), 0.98 (dist.t, 3H,CH_3); ^{13}C NMR: 14.1, 22.3, 30.9, 29.2, 31.5, 34.3, 37.2, 72.1, 110.8, 119.1, 124.3, 129.1, 130.5, 141.4, 148.3, 168.1, MS: 407 (14%), 405 (34%), 349 (28%), 335 (40%), 167 (100%), 153 (22%).
5a	IR: 2858 (CH), 1588 (C═N), 1472 (CO) ^{1}H NMR: 7.97-7.92 (m, 2H, Ar-H), 6.85-6.82 (m,1H, Ar-H), 5.85-5.75 (tdd, 1H, $J_{H-^8CH_2}$ 6.6 Hz, J_{H-H_Z} 10.2 Hz, J_{H-H_E} 17.1 Hz, CH_2═CH-), 5.01-4.91(dd,1H, J_{H_Z-H}10.2 Hz, $J_{H_Z-H_E}$ 1.2 Hz, H_ZC═CH-), 4.90 (dd, 1H, J_{H_E-H} 17.1 Hz, $J_{H_E-H_Z}$ 1.2 Hz, H_EC═CH-), 2.81 (t, 2H, $J = 8.2$ Hz, CH_2 α to oxazole ring), 2.03-2.01 (m, 2H, -CH_2-CH═CH_2), 1.91-1.87 (m,2H, -CH_2 β to oxazole ring), 1.31 (br.s, 10H, chain CH_2); ^{13}C NMR: 29.2, 33.8, 34.3, 111.8, 114.2, 114.9, 119.5, 139.1, 141.8, 144.3, 155.8, 169.3. MS: 302 (38%), 191 (28%), 177 (100%), 163 (27%).
5b	IR: 2852 (CH), 1580 (C═N), 1465 (CO) ^{1}H NMR: 7.98-7.95 (m, 2H, Ar-H), 6.86-6.83 (m,1H, Ar-*H*), 5.37-5.33 (2H, m, -CH═CH-), 2.67(t, 2H, $J = 8.0$ Hz, -CH_2 α to oxazole ring), 2.05-2.01(m, 4H, -CH_2-CH═CH-CH_2-), 1.92-1.84 (m, 2H, -CH_2 β to oxazole ring), 1.29 (br.s, 20H, chain CH_2), 0.88 (dist.t, 3H, CH_3);

(Continued on next page)

TABLE VII Spectral Data of the Newly Synthesized Compounds *(Continued)*

Comp. no.	Spectral data
	^{13}C NMR: 14.1, 22.7, 29.3, 31.9, 33.5, 34.3, 111.7, 114.9, 119.5, 130.1, 141.7, 144.3, 155.8, 169.2.
	MS: 400 (25%), 301 (39%), 287 (40%), 177 (100%), 163 (27).
5c	IR: 2870 (CH), 1575 (C═N), 1480 (CO)
	^{1}H NMR: 7.96-7.94 (m, 2H, Ar-H), 6.84-6.81 (m,1H, Ar-H), 5.49-5.44 (m, 2H, -CH═CH-), 3.69-3.67 (m,1H, -CH-OH), 2.66 (t, 2H, $J = 7.6$ Hz, -CH_2 α to oxazole ring), 2.43-2.41 (m,1H, -CH-OH), 2.04-1.98 (m, 4H, -CH_2-CH═CH-CH_2-), 1.91–1.87 (m, 2H, -CH_2 β to oxazole ring), 1.29 (br.s, 18H, chain CH_2), 0.88 (dist.t, 3H, CH_3);
	^{13}C NMR: 14.1, 22.6, 25.3, 29.6, 31.5, 31.9, 34.3, 39.1, 71.5, 111.7, 114.8, 119.4, 130.1, 141.7, 144.2, 155.8, 169.2.
	MS: 416 (21%), 331 (39%), 287 (25%), 177 (100%), 163 (29).
5d	IR: 2868 (CH), 1577 (C═N), 1482 (CO)
	^{1}H NMR: 7.97-7.95 (m, 2H, Ar-H), 6.82 (m,1H, Ar-H), 5.49-5.44 (m, 2H, -CH═CH-), 4.08-4.01(m,1H, -CH-OH), 2.88 (t, 2H, $J = 7.2$ Hz, -CH_2 α to oxazole ring), 2.33-2.26 (m, 1H, -CH-OH), 2.07-2.00 (m, 4H, -CH_2-CH═CH-CH_2-), 1.89-1.84 (m, 2H, -CH_2 β to oxazole ring), 1.44 (br.s, 18H, chain CH_2), 0.98 (dist.t, 3H, CH_3);
	^{13}C NMR: 14.1, 22.3, 29.2, 30.9, 31.5, 34.3, 37.2, 72.1, 111.7, 114.9, 119.4, 130.5, 141.7, 144.3, 155.8, 169.2.
	MS: 416 (18%), 359 (35%), 345 (45%), 177 (100%), 163 (25).
6a	IR: 2898(CH), 1700(C═N), 1475(CO)
	^{1}H NMR: 7.74-7.69 (m, 2H, Ar-H), 7.64-7.62 (m, 2H, Ar-H), 7.38-7.37 (m, 2H, Ar-H), 5.85-5.75 (tdd, 1H, $J_{H-^{8}CH_2}$ 6.6 Hz, J_{H-H_Z} 10.2 Hz, J_{H-H_E} 17.1 Hz, CH_2═CH-), 5.01-4.91(dd, 1H, J_{H_Z-H}10.2 Hz, $J_{H_Z-H_E}$ 1.2 Hz, H_ZC═CH-), 4.90 (dd, 1H, J_{H_E-H} 17.1 Hz, $J_{H_E-H_Z}$ 1.2 Hz, H_EC═CH-), 2.88 (t, 2H, $J = 4.0$ Hz, CH_2 α to oxazole ring), 2.03-2.01 (m, 2H, -CH_2-CH═CH_2), 1.91-1.87 (m, 2H, -CH_2 β to oxazole ring), 1.31 (br.s, 10H, chain CH_2);
	^{13}C NMR: 29.2, 33.8, 34.3, 111.7, 114.2, 119.3, 124.8, 125.2, 125.6, 127.3, 139.1, 139.2, 151.3, 165.3.
	MS: 307 (23%), 196 (37%), 182 (100%), 168 (38%).
6b	IR: 2898 (CH), 1700(C═N), 1485 (CO)
	^{1}H NMR: 7.73-7.70 (m, 2H, Ar-H), 7.63-7.62 (m, 2H, Ar-H), 7.38-7.37 (m, 2H, Ar-H), 5.37-5.33 (m, 2H, -CH═C*H*-), 2.89(t, 2H, $J = 4.2$ Hz, -CH_2 α to oxazole ring), 2.05-2.01(m, 4H, -CH_2-CH═CH-CH_2-), 1.92-1.84 (m, 2H, -CH_2 β to oxazole ring), 1.29 (br.s, 20H, chain CH_2), 0.88 (dist.t, 3H, CH_3);
	^{13}C NMR: 165.3, 139.2, 151.3, 111.7, 125.6, 127.3, 125.2 , 124.8, 119.3, 33.5, 31.9, 34.3, 130.0, 29.3, 22.7, 14.1;
	MS: 407 (26%), 316 (40%), 302 (33%), 182 (100%), 168 (35%).

(Continued on next page)

TABLE VII Spectral Data of the Newly Synthesized Compounds *(Continued)*

Comp. no.	Spectral data
6c	IR: 2898 (CH), 1700 (C═N), 1475 (CO) ^{1}H NMR: 7.73-7.70 (m, 2H, Ar-H), 7.63-7.62 (m, 2H, Ar-H), 7.38-7.37 (m, 2H, Ar-H), 5.49-5.44 (m, 2H, -CH═CH-), 3.69-3.67 (m, 1H, -CH-OH), 2.89 (t, 2H, $J = 4.0$ Hz, -CH_2 α to oxazole ring) , 2.43-2.41 (m, 1H, -CH-OH), 2.04-1.98 (m, 4H, -CH_2-CH═CH-CH_2-), 1.91–1.89 (m, 2H, -CH_2 β to oxazole ring), 1.29 (br.s, 18H, chain CH_2), 0.88 (dist.t, 3H, CH_3); ^{13}C NMR: 14.1, 22.6, 25.3, 29.6, 31.5, 31.9, 34.3, 39.1, 71.5, 111.7, 119.3, 124.8, 125.2, 125.6, 127.3, 130.1, 139.2, 151.3, 165.3. MS: 421 (22%), 346 (45%), 316 (18%), 302 (28%), 177 (100%), 168 (25%).
6d	IR: 2898 (CH), 1655 (C═N), 1470 (CO) ^{1}H NMR: 7.73-7.70 (m, 2H, Ar-H), 7.63-7.62 (m, 2H, Ar-H), 7.38-7.37 (m, 2H, Ar-H), 5.49-5.44 (m, 2H, -CH═CH-), 4.08-4.01(m, 1H, -CH-OH), 2.88 (t, 2H, $J = 7.2$ Hz, -CH_2 α to oxazole ring), 2.33-2.26 (m, 1H, -CH-OH), 2.07-2.00 (m, 4H, -CH_2-CH═CH-CH_2-), 1.89-1.84 (m, 2H, -CH_2 β to oxazole ring), 1.44 (br.s, 18H, chain CH_2), 0.98 (dist.t, 3H, CH_3); ^{13}C NMR: 14.1, 22.6, 25.3, 29.6, 31.5, 31.9, 34.3, 39.1, 71.5, 111.7, 119.3, 124.8, 125.2, 125.6, 127.3, 130.1, 139.2, 151.3, 165.3. MS: 421 (24%), 364 (28%), 350 (47%), 177 (100%), 168 (25).

compounds and visualized using an iodine chamber. The homogeneity of the product was observed using TLC. ^{1}H NMR and ^{13}C NMR spectra were recorded in $CDCl_3$ on a Bruker Avance II-400 instrument using $CDCl_3$ as solvent and TMS as internal standard. Coupling constants are expressed in Hz. Mass spectra were obtained on a Jeol SX-102 (FAB) spectrometer. IR spectra were obtained on Shimadzu 8201 PC FT-IR using KBr pellets. The MW irradiations were carried out using an unmodified domestic oven (LG, Model MC-808WAR, 1.35 KW, 2450MHz).

Synthesis of 2-Dec-9-enyl-1*H*-benzoxazole (2a), 2-Heptadec-9-enyl-1*H*-benzoxazole (2b), 17-Benzoxazol-2-yl-heptadec-9-en-7-ol (2c), and 1-Benzoxazol-2-yl-heptadec-11-en-8-ol (2d)

The 2-aminophenol **2** (2.5 mmol), the fatty acid **1** (3.75 mmol), P_4S_{10} (0.06 mmol), and 2.5 g of silica gel were mixed thoroughly in a beaker. The beaker was placed in a domestic microwave oven and heated under microwave-assisted dielectric heating (multimode), irradiated at 60% power for 6–7 min (monitored by TLC). All microwave experiments

were conducted at atmospheric pressure. After cooling, the product was extracted with Et_2O (2 × 30 mL). The combined organic layer was washed with saturated solution of $NaHCO_3$ (2 × 10 mL), dried over anhydrous Na_2SO_4, and evaporated under reduced pressure to leave the crude product. The products were purified by column chromatography on silica gel (hexane: diethyl ether, 99:1v/v).

Synthesis of 2-Dec-9-enyl-5-methyl-1*H*-benzoxazole (3a), 2-Heptadec-8-enyl-5-methyl-1*H*-benzoxazole (3b), 17-(5-Methyl-1*H*-benzoxazol-2-yl)-heptadec-9-en-7-ol (3c), and 1-(5-Methyl-1*H*-benzoxazol-2-yl)-heptadec-11-en-8-ol (3d)

The 2-amino-4-methyl phenol **3** (2.5 mmol), the fatty acid **1** (3.75 mmol), P_4S_{10} (0.06 mmol), and 2.5 g of silica gel were mixed thoroughly in a beaker. The reaction was carried out in microwave oven, irradiated at 60% power for 8 min for compound **3a** and **3b** and 9 min for **3c** and **3d** (monitored by TLC). Once cooled, the products were extracted and purified as described above.

Synthesis of 5-Chloro-2-dec-9-enyl-1*H*-benzoxazole (4a), 5-Chloro-2-heptadec-8-enyl-1*H*-benzoxazole (4b), 17-(5-Chloro-1*H*-benzoxazol-2-yl)-heptadec-9-en-7-ol (4c), and 1-(5-Chloro-1*H*-benzoxazol-2-yl)-heptadec-11-en-8-ol (4d)

The 2-amino-4-chloro phenol **4** (2.5 mmol), the fatty acid **1** (3.75 mmol), P_4S_{10} (0.06 mmol), and 2.5 g of silica gel were mixed thoroughly in a beaker. The reaction was performed in microwave oven (multimode), irradiated at 60% power for the time given in Table III. After cooling, the products were extracted and purified as described in the preceding reaction.

Synthesis of 2-Dec-9-enyl-5-nitro-1*H*-benzoxazole (5a), 2-Heptadec-8-enyl-5-nitro-1*H*-benzoxazole (5b), 17-(5-Nitro-1*H*-benzxazol-2-yl)-heptadec-9-en-7-ol (5c), and 1-(5-Nitro-1*H*-benzoxazol-2-yl)-heptadec-11-en-8-ol (5d)

The 2-amino-4-nitro-phenol **5** (2.5 mmol), the fatty acid **1** (3.75 mmol), P_4S_{10} (0.06 mmol), and 2.5 g of silica gel were mixed thoroughly in a beaker. The beaker was placed in a domestic microwave oven (multimode) and irradiated at 60% power for 13 min (**5a**, **5b)** and 14 min (**5c**, **5d**, Table III). After cooling, the products were extracted and purified as above.

Synthesis of 2-Dec-9-enyl-naphtho [2, 3-*d*]-oxazole (6a), 2-Heptadec-8-enyl-naphtho [2, 3-*d*]-oxazole (6b), 17-Naphtho [2, 3-*d*]-oxazol-2-yl-heptadec-9-en-7-ol (6c), and 1-Naphtho [2, 3-*d*] oxazol-2-yl-heptadec-11-en-8-ol (6d)

The 2-amino-2-naphthalen-2-ol **6** (2.5 mmol), the fatty acid **1** (3.75 mmol), P_4S_{10} (0.06 mmol), and 2.5 g of silica gel were mixed thoroughly in a beaker. The reaction was carried out as described in Tables II and III. After cooling, the products were extracted with Et_2O and washed with saturated solution of $NaHCO_3$, dried over anhydrous Na_2SO_4, and evaporated under reduced pressure to leave the crude product. The products were purified by column chromatography on silica gel (hexane: diethyl ether, 97:3 v/v).

CONCLUSION

In summary, we have developed a fast and convenient method to synthesize 2-alkenylbenzoxazoles in high yields from 2-aminophenol and long alkenyl chain carboxylic acids in the presence of a catalytic amount of phosphorus pentasulphide under microwave-assisted, solvent-free conditions. The method is advantageous in terms of reduced reaction time, high yield of products, no use of organic solvents, and simple experimental and work-up procedure, thus adding a useful procedure to existing methodologies.

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